THE NATURAL HISTORY OF PLANTS.

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MENISPERMACEÆ, BERBERIDACEÆ, NYMPHÆACEÆ, PAPAVERACEÆ, CAPPARIDACEÆ, CRUCIFERÆ, RESEDACEÆ, CRASSULACEÆ, SAXIFRAGACEÆ, PIPERACEÆ, URTICACEÆ.

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NATURAL HISTORY OF PLANTS.

XIII. MENISPERMACEÆ.

I. COCCULUS SERIES.

The great genus *Cocculus*[1] was formerly held to include the greater part of this order, and to it were referred the plants that produce

Anamirta Cocculus.

FIG. 1.—Male flowering branch (1/3).

[1] C. BAUH., *Pinax*, 511, ex DC., *Syst.*, i. 515; *Prodr.*, i. 96.—SPACH, *Suit. à Buffon*, viii. 13.—ENDL., *Gen.*, n. 4687 (part.).—B. H., *Gen.*, 36, 961, n. 16.—MIERS, in *Ann. Nat.*

the Indian Berry (fig. 1), and Colombo Root (fig. 16), &c.; but it is now reduced to a far more limited number of species, generally remarkable for their trimerous flowers, with calyx, corolla and androceum each formed of two whorls. In *Cocculus* proper, as in all known *Menispermaceæ*, the flowers are small and diœcious, with a small convex receptacle. If, for instance, we analyse those of *C. carolinus*,[1] which flourish in our gardens, we usually find[2] in the

Cocculus carolinus.

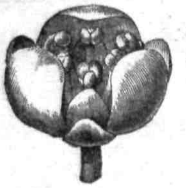

FIG. 2.
Male flower ($\frac{6}{1}$).

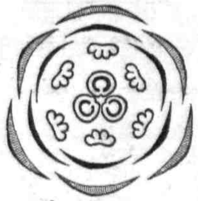

FIG. 3.
Diagram.

FIG. 4.
Long. sect. of male flower.

male flowers (figs. 2–4) an outer calyx of three sepals, and an inner calyx of three more, alternating with the former, and like them valvate in the bud and petaloid. Internal to these come three petals superposed to the outer petals, and three more superposed to the inner ones. These are all similar to one another, shorter and thicker than the sepals, concave inside, and with their edges inflexed to partially envelope the superposed stamens. These, forming two whorls, and all similar, consist each of a free filament, dilated above, and a basifixed introrse four-lobed two-celled anther, of longitudinal dehiscence.[3] The centre of the flower is occupied by three or six little free bodies, representing rudimentary carpels. In

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Hist., ser. 3, xix. 19.—*Nephroia* LOUR., *Fl. Cochinch.*, 565.—*Epibaterium* FORST., *Char. Gen.*, t. 54.—*Wendlandia* W., *Spec. Pl.*, ii. 275.—*Cebatha* FORSK., *Fl. Ægypt.-Arab.*, 171. —*Leæba* FORSK., *op. cit.*, 172.—*Cocculidium* SPACH, *loc. cit.*, 16.—*Adenocheton* FENZL., in *Flora* (1844), 312.—*Nephroica* MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 42.—*Holopeira* MIERS, *loc. cit.* (incl.: *Diploclisia* MIERS, *Limacia* LOUR., *Pericampylus* MIERS, ? *Tristichocalyx* F. MUELL.).

1 DC., *Syst.*, i. 524; *Prodr.*, i. 98, n. 25.—*Menispermum carolinum* L., *Spec.*, 1468.—*M. virginianum* Hort. — *Wendlandia populifolia* W., *loc. cit.* (ex DC.).

2 But not constantly, for the sepals are often accompanied by three, or even six, others, exterior and smaller. These are often called bracts, but they are of the same nature as the other sepals, only differing in their smaller size. It is the presence of these extra whorls that leads us to doubt the value of the Australian genus *Tristichocalyx* (F. MUELL., *Fragm. Phyt. Austral.*, iv. 27;—B. H., *Gen.*, 952, n. 17 *a*;—MIERS, in *Ann. Nat. Hist.*, ser. 3, xix. 87), unknown to us, but of which BENTHAM says, "*Cocculo* valde affine, differre videtur imprimis sepalis 3-seriatis."

3 Despite outward appearances, there are really only two cells, in each of which is an erect rudimentary septum perpendicular to the true one.

the female flowers the perianth is the same; but the androceum differs by the absence of the anthers or their becoming narrow, elongated and sterile.[1] The gynæceum consists of three carpels, each consisting of a free ovary surmounted by a reflexed style that tapers to its stigmatiferous apex. In the ventral angle of the single cell of each ovary is a placenta bearing, on anthesis,[2] a single descending anatropous ovule, whose micropyle looks upwards and outwards. The multiple fruit consists of three rounded reniform drupes, with the scar of the style brought down near the base.[3] Under the thin fleshy mesocarp is a stone whose depressed sides send inwards an unequally perforated or solid projection (*condyle* of MIERS), the base of which is near that of the fruit. The back of the seed is uneven and tuberculate; its cavity contains a bowed seed, moulded on the internal prominence of the stone. Within the seed-coat is a fleshy albumen, containing in its axis a narrow curved embryo, with linear, somewhat flattened cotyledons, and a superior conical radicle.

The fruits of *C. macrocarpus*[4] are obovate and more elongated than usual; this species has been made into a distinct genus *Diploclisia*,[5] which we only retain as a section. In *C. incanus*[6] the styles, of variable form, are often subulate and bipartite; this too has been made into a distinct genus *Pericampylos*.[7] In *C. cuspidatus*[8] and some allied species,[9] the stamens, more swollen at the apex, have their cells more elongated and nearer the vertical, while the internal prominences of the stone contain a more distinct cavity; this distinguishes *Limacia*,[10] whereof we propose to make another section of the genus *Cocculus*, as their organization is otherwise similar.

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[1] The two cells and the groove separating them may often be distinguished, but there is no pollen. In the cultivated plants hermaphrodite flowers occur (fig. 3), with ovules in the ovaries, and a variable number of fertile stamens.

[2] When young there are two ovules, and PAYER (*Traité d'Organog. Comp. de la Fleur*, 243, t. 53) noticed them in *Cocculus*, *Menispermum*, and *Cissampelos*. We have seen them (*Adansonia*, ii. 320) in *Burasaia madagascariensis* and *Jateorhiza strigosa* MIERS (*Adansonia*, v. 365), and GRIFFITH has in *Fibraurea*. We shall see that they persist all along in *Adeliopsis*.

[3] This incurvation of the pericarp is thus comparable with the campylotropy of ovules.

[4] WIGHT & ARN., *Prodr.*, i. 13.—WALP., *Rep.*, i. 94, n. 15.

[5] MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 42; ser. 3, xix. 84.

[6] COLEBR., in *Trans. Linn. Soc.*, xiii. 57.—*Clypea corymbosa* BL., *Bijdr.*, 24.—*Menispermum villosum* ROXB., *Fl. Ind.*, iii. 812 (nec LAMK.). — *Cissampelos Wallichiana* WALL., *Cat.*, n. 4980 (nec DC.).

[7] MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 40; ser. 3, xiv. 369.—B. H., *Gen.*, 37, 961, n. 17.—*Legnephora* MIERS, in *Ann. Nat. Hist.*, ser. 3, xiv. 88. (A doubtful synonym of *Pselium*, p. 20, not. 6.)

[8] WALL., *Cat.*, n. 4960.

[9] Such as *C. velutinus* WALL., *triandrus* COLEBR., *oblongus* WALL.

[10] LOUR., *Fl. Cochinch.*, 620.—MIERS, in

Spirospermum[1] has the male flowers of *Cocculus*, but with more vertical anthers of submarginal or slightly introrse longitudinal dehiscence. The female flower is unknown, but the fruit is characteristic; it is flattened and orbicular, and rolled round itself in a plane into a spiral; while the thin albumen and embryo, contained in the stone, are rolled up with it. *S. penduliflorum* DUP.-TH.,[2] the only known species of this genus, is a climbing glabrous shrub from Madagascar. Its leaves are oblong coriaceous; and its flowers form racemes, which have more ramified and slenderer axes in the male plants than in the females.

Tiliacora[3] has nearly the flower of *Cocculus;* but the three inner sepals are much longer than the others, and nearly petaloid. The stamens have elongated introrse two-celled anthers of vertical dehiscence. The fruit consists of drupes, of which there may be as many as twelve; each is short and club-shaped; the stone is folded lengthwise over a vertical septum, over which the albuminous seed is also folded. The only known species, except a doubtful one from Africa,[4] is Indian.[5]

Synclisia[6] *scabrida*[7] is a plant from the west of Tropical Africa, whose place will remain uncertain so long as the female flower and fruit are unstudied; its male flower has nine sepals, whereof the three innermost are much more developed than the rest; six small petals; and six stamens, only coherent towards the base, and bearing anthers with sublateral longitudinal cells. Herein it comes very near *Tiliacorus*, differing chiefly in that its three large inner sepals are united edge to edge nearly all the way up, into a sort of tube simulating a gamopetalous corolla.

In *Anomospermum*,[8] the flowers again resume nearly the symmetry

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[1] DUP.-TH., *Gen. Nov. Madag.*, 19, n. 63.—DC., *Syst.*, i. 514; *Prodr.*, i. 96.—ENDL., *Gen.*, n. 4690.—B. H., *Gen.*, 39, n. 30; 962, n. 17 *b.*—MIERS, in *Ann. Sc. Nat.*, sér. 3, xiii. 125.—H. BN., in *Adansonia*, viii. 154.

[2] *Cocculus milleflorus* DC., *Syst.*, i. 530; *Prodr.*, i. 99, n. 42. (*C. gomphioides* DC., *Prodr.*, n. 42, does not belong to this genus, as we at first thought. Its leaves are nearly those of *S. penduliflorum*, but the fruits are neither bowed nor coiled in a spiral. Though unripe, the seeds appear to resemble those of the *Chasmantherea*.

[3] COLEBR., in *Trans. Linn. Soc.*, xiii. 53.—ENDL., *Gen.*, n. 4687 (*Cocculus*).—B. H., *Gen.*, 36, 961, n. 13.—MIERS, in *Ann. Nat. Hist.*, ser. 3, xiv. 252.—*Braunea* W., *Spec.*, iv. 797 (part.).

[4] *T. ? funifera* OLIV., *Fl. Trop. Afr.*, i. 44.

[5] *T. acuminata.*—*T. racemosa* COLEBR., *loc. cit.*, 53, 67.—*Menispermum acuminatum* LAMK., *Dict.*, iv. 101.—*M. radiatum* LAMK., *loc. cit.*—*M. polycarpum* ROXB., *Fl. Ind.*, iii. 816.—*Cocculus acuminatus* DC., *Prodr.*, i. 99, n. 34.—DELESS., *Ic. Sel.*, i. t. 95.—*C. radiatus* DC., *Prodr.*, n. 35.—*C. bantamensis* BL., *Bijdr.*, 26.—*C. polycarpus* WALL., *Cat.*, n. 4958 (part.).—*Braunea menispermoides* W., *loc. cit.*

[6] BENTH., *Gen*, 36, n. 14.

[7] MIERS, in *Ann. Nat. Hist.*, ser. 3, xx. 171.—OLIV., *Fl. Trop. Afr.*, i. 49.

[8] MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 39;

of *Cocculus*. But the inner sepals are still very large as compared with the outer ones. The petals are short thick and fleshy, each surrounding the foot of its superposed stamen; by their approximation they simulate a sort of large triangular disk, hollowed into six pits. The fruit, moreover, is remarkable for being straight. The inside of the stone bears only a vertical projecting blade, which makes a straight groove down the inner face of the seed, whose ruminated albumen is divided into horizontal lamellæ. The three or four species known come from Tropical America.[1]

Sarcopetalum[2] has the same fruit as *Cocculus* or *Menispermum*, and the same linear albuminous embryo. The perianth, too, is sometimes similarly formed of six sepals and six petals. In this case the genus is only distinguished by the thickness of its petals, comparable to those of *Anomospermum*, and forming thick wrinkled irregularly obovoid fleshy masses; and by the androceum, which consists of a central erect fleshy column, divided above into from two to four short diverging branches, each bearing the two adnate cells of the horizontal anther. However, botanists have placed this genus in the *Cissampelideæ*[3] because the number of pieces in its perianth often falls below that given above; the number of petals and sepals being reduced to two or three of each. *S. Harveianum* F. MUELL, the only known species of this genus, is an Australian liana, with alternate cordate leaves, and flowers forming solitary or fascicled simple lateral racemes.

II. PACHYGONE SERIES.

In flowers and vegetative organs *Pachygone*[4] has all the characters of *Cocculus*; and the only reason for making it the type of a distinct series is that its seeds are exalbuminous. The embryo is large and curved like a horseshoe, with a short superior embryo, and thick

ser. 3, xiv. 101.—BENTH., in *Journ. Linn. Soc.*, v. Suppl., 48.—B. H., *Gen.*, 35, 961, n. 11.—? *Elisarrhena* MIERS, in *Ann. Nat. Hist.*, ser. 3, xiii. 124.

[1] EICHL., in *Mart. Fl. Bras., Menisp.*, 169, t. 37, 38.

[2] F. MUELL., *Pl. Indig. Col. Vict.*, i. 26, 221, t. Suppl. iii.—B. H., *Gen.*, 37, 962, n. 19.—MIERS, in *Ann. Nat. Hist.*, ser. 3, xix. 90.—BENTH., *Fl. Austral.*, i. 56.

[3] We, however, remove it hither because the regularity of its double perianth may be perfect, and the female flowers lack the unilateral arrangement characterising those of *Cissampelideæ*.

[4] MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 43 ser. 3, xix. 319.—B. H., *Gen.*, 38, 963, n. 23.

fleshy or subcorneous cotyledons (figs. 12, 13). We cannot make a distinct genus for *Hyperbæna*,[1] which has somewhat more elongated carpels with thinner bowed styles. We make it only a section of the genus *Pachygone*, which thus constituted contains half a dozen species[2] from Tropical Asia and America. All the species of *Hyperbæna* are American.

Pachygone ovata.

FIG. 12. Fruit ($\frac{3}{1}$).

FIG. 13. Long. sect. of fruit.

Pycnarrhena and *Hæmatocarpus*[3] come very near *Pachygone*, whereof they have the general organization. The latter has a calyx of from three to five trimerous verticils, and six stamens incurved above with lateral anther-cells. The only known species is Indian.[4] *Pycnarrhena*[5] has nine short stamens, inserted on a swollen subglobular receptacle, and the two anther-cells blend below on dehiscence. Two or three species are known,[6] natives of India and the neighbouring islands of Oceania.

Chondodendron[7] is also nearly allied to the preceding genera. It may have as many as six whorls to the calyx, and the three innermost stamens are large and petaloid, reflexed at the apex. The anther-cells are lateral, with an apiculate inflexed connective. The fruits are stipitate drupes. This genus contains half a dozen American species.[8]

Sychnosepalum,[9] also American, is nearly allied to the last genus. Its flowers possess an indefinite number of stamens superposed in six vertical rows, with terminal anthers and unprolonged connectives; all or certain of the filaments cohere together; their fruits are also coherent at the base. Three species have been described.

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[1] MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 44; ser. 3, xix. 92.—B. H., *Gen.*, 38, 963, n. 24.

[2] DELESS., *Ic. Sel.*, i. t. 96 (*Cocculus*).—WIGHT, *Icon.*, t. 824, 825.—BENTH., in *Journ. Linn. Soc.*, v. Suppl., 50 (*Hyperbæna*).—GRISEB., *Fl. Brit. W. Ind.*, 10 (*Cocculus*); *Pl. Wright.*, 4 (*Anomospermum*, sect. *Apabuta*).—EICHL., in *Mart. Fl. Bras.*, *Menisp.*, 195, t. 47 (*Pachygone*).—WALP., *Ann.*, iv. 133.

[3] MIERS, in *Ann. Nat. Hist.*, ser. 3, xix. 194.—B. H., *Gen.*, 964, n. 28.—*Baterium* MIERS (ex ips., *loc. cit.*, 194).

[4] HOOK. & THOMS., *Fl. Ind.*, i. 204 (*Fibraurea*).

[5] MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 44.—B. H., *Gen.*, 38, n. 25.

[6] WALP., *Ann.*, iv. 134.

[7] R. & PAV., *Prodr.*, 132 (nec *alior.*).—MIERS, in *Ann. Nat. Hist.*, ser. 3, xix. 187.—B. H., *Gen.*, 963, n. 26.—*Botryopsis* MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 43.—B. H., *Gen.*, 38, n. 26.

[8] EICHL., in *Mart. Fl. Bras.*, *Menisp.*, 199, t. 48 (*Botryopsis*).

[9] EICHL., in *Mart. Fl. Bras.*, *Menisp.*, 202, t. 49.—MIERS, in *Ann. Nat. Hist.*, ser. 3, xix. 192.—B. H., *Gen.*, 963, n. 26 *a*.—*Detandra* MIERS, *loc. cit.*, 124.

Only the female flowers of *Sciadotænia*[1] are known. They come very near those of the preceding genera, possessing a triple or quadruple calyx and six petals, to which as many sterile stamens are superposed. But the fruit consists of a variable number of drupes (sometimes as high as twelve), supported on club-shaped feet, and free or connate at the base; each contains a horseshoe shaped seed. The three described species[2] inhabit Guiana and the neighbouring parts of Brazil.

Pleogyne,[3] whereof only a single Australian species[4] is known, has a double or triple calyx, the three internal sepals of which are the largest, as in *Chondodendron*. The androceum is reduced to three stamens alternating with these large sepals. The fruit consists of from three to six drupes with the scar of the style lateral, containing a reniform seed with superficially conferruminate cotyledons.

Triclisia subcordata.

FIG. 14. Embryo ($\frac{3}{1}$).

Triclisia,[5] a genus confined as yet to the west of Tropical Africa, has a calyx of from nine to twelve stamens, with the three innermost largest and more or less petaloid and valvate. The corolla is wanting, and the androceum consist of six stamens or of only three,[6] through the absence of those superposed to the three innermost sepals. The filaments are free; the connective is apiculate or muticous, gibbous and thickened above and outside, and the anther-cells are introrse but nearly lateral. The fruit consists of an unknown number of drupes, and is characterized by their being straight, with the scar of the style nearly terminal,[7] while the prominence of the inner wall of the stone near the attachment of the seed is very slight. The fleshy embryo, straight or bowed, consists almost wholly of a single much developed cylindrical cotyledon; the other cotyledon being very small and occupying the

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[1] MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 43; ser. 3, xix. 325.—B. H., *Gen.*, 39, 964, n. 29.

[2] EICHL., in *Mart. Fl. Bras.*, *Menisp.*, 201, t. 47.

[3] MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 43; ser. 3, xix. 22.—B. H., *Gen.*, 963, n. 27 *a.*—*Microclisia* BENTH., *Gen.*, add., 435, n. 27 *a.*

[4] *P. australis* MIERS.—BENTH., *Fl. Austral.*, i. 58.

[5] BENTH., in B. H., *Gen.*, 39, 963, n. 27.—H. BN., in *Adansonia*, ix. 316.

[6] Only in one doubtful species. *T. ? patens* OLIV.

[7] In *T. subcordata* OLIV., the only species in which it has been possible to study them.

The genus *Jateorhiza*, distinguished from *Chasmanthera* chiefly by the form of its male flowers, contains, among other species, *J. strigosa*,[1] from the west of Tropical Africa; this has the female flowers, prickly fruits and seeds formed as in *Chasmanthera dependens*,

Chasmanthera Columba.

FIG. 16.
Male floriferous branch ($\frac{1}{3}$).

while its stamens are monadelphous; so that these two plants differ in no point of generic value. Nay, they are far closer to one another than to the Colombo-root plant, which has been named *J. Columba*[2] (figs. 16, 17), and which no one has thought of putting in a different genus to that of *J. strigosa*. Yet it has free stamens, its male flower becoming quite that of a *Cocculus*. The female

[1] MIERS, *Niger*, 213, t. 18.—*Cocculus? macranthus* HOOK. F., *loc. cit.*—*Chasmanthera strigosa* H. BN., in *Adansonia*, v. 364.

[2] MIERS, *Niger*, 214, not.—*Cocculus palmatus* DC., *Syst.*, i. 522; *Prodr.*, i. 98, n. 22.—*Menispermum Columba* ROXB., *Fl. Ind.*, iii. 807.

flowers, fruits, and vegetative organs are quite those of the preceding species. *Tinospora*[1] has also free stamens with all the other characters of *C. Columba,* only the anther-cells are more lateral or even slightly introrse; a detail which is certainly not of a kind to allow us to make *Tinospora* anything more than a section of the genus *Chasmanthera.* This, so constituted,[2] contains some twelve species, found in the east and west of Tropical Africa and in Tropical Asia.[3]

Chasmanthera Columba.

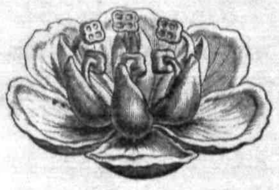

FIG. 17.
Male flower (8/1).

The American plant called *Calycocarpum Lyoni*[4] has nearly the female flowers and fruit of *Chasmanthera;* but its male flowers differ,[5] usually possessing over six, and even as many as twelve stamens, with elongated basifixed introrse anthers, opening by two longitudinal clefts. The leaves are large and palmatilobed, cordate at the base. The flowers form lax elongated, axillary supra-axillary or lateral, compound racemes.

Next to these genera come four others which have the same general organization and embryos with divaricating cotyledons: *Tinomiscium, Odontocarya, Fibraurea* and *Burasaia.*

Of *Tinomiscium*[6] two species are known, one Indian,[7] the other Javanese;[8] their calyx has three or four verticils; the fruit is compressed, apiculated by the scar of the apical style, possessing a stone whose inner surface is flat, with a straight, internal prominence.

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[1] MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 38; ser. 3, xiii. 486.—B. H., *Gen.*, 34, 960, n. 5.—H. BN., in *Adansonia*, ix. 306.

[2]

Chasmanthera. Sect. 4.	1. *Euchasmanthera.* 2. *Jateorhiza.* 3. *Colombo.* 4. *Tinospora.*

[3] WIGHT, *Icon.*, t. 485, 486 (*Tinospora*).—GUILL. & PERR., *Fl. Sen. Tent.*, i. 12, t. 4 (*Cocculus*).—MIERS, in *Hook. Niger*, 212, t. 18; in *Ann. Nat. Hist.*, ser. 2, vii. 38 (*Tinospora, Jateorhiza*); ser. 3, xiii. 132 (*Jateorhiza*), 315 (*Tinospora*), 486 (*Chasmanthera*).—THW., *Enum. Pl. Zeyl.*, 12.—OLIV., *Fl. Trop. Afr.*, i. 40–43.—*Bot. Mag.*, t. 2970.—WALP., *Rep.*, v. 18 (*Chasmanthera*); *Ann.*, ii. 21 (*Jateorhiza*); iv. 124 (*Tinospora*).

[4] NUTT., ex TORR. & GR., *Fl. N. Amer.*, i. 48.—A. GRAY, *Gen. Ill.*, t. 30.—B. H., *Gen.*, 35, 961, n. 8.—CHAPM., *Fl. S. Unit. St.*, 16.—MIERS, in *Ann. Nat. Hist.*, ser. 3, xiii. 50.—WALP., *Ann.*, ii. 20.—*Menispermum Lyoni* PURSH, *Fl. Am. Sept.*, ii. 371.—DC., *Prodr.*, i. 103, n. 4.

[5] They are said to have six flattened petals, shorter than the calyx. I have been unable to see them.

[6] MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 44; ser. 3, xiii. 489.—B. H., *Gen.*, 34, 960, n. 6.

[7] *T. petiolare* MIERS.—HOOK. & THOMS., *Fl. Ind.*, i. 205.—WALP., *Ann.*, iv. 135.—*Cocculus petiolaris* WALL., *Cat.*, n. 4964.

[8] *T. javanicum* MIERS.

Odontocarya[1] is American.[2] The staminal filaments are halfway up, and the anther-cells are distinct. The form of the internal prominence of the fruit-stone resembles that of *Chasmanthera*.

Fibraurea,[3] whereof only one Asiatic species[4] is described, has six free club-shaped stamens, slightly incurved towards the apex, and the ventral surface of the fruit-stone bears a well marked hollow internal prominence.

Burasaia[5] consists of four species[6] of plants from Madagascar, which were formerly referred to *Lardizabaleæ*. We were the first to show that they are quite similar to the preceding genera in the structure of the fruit, the stone bearing a longitudinal groove outside and a semi-ovoidal prominence inside on the ventral face. But they are very sharply distinguished from all the allied types by their trifoliolate leaves.

The two Indian genera *Parabæna*[7] and *Aspidocarya*,[8] each represented by a single species, have, with the same female flowers and fruit, a quite distinct androceum, formed of a vertical cylindrical column, on top of which are found six sessile anthers. This column is dilated at the top into a circular platform in the latter genus and is capitate in the former.

Anamirta[9] (figs. 1, 18–21) has apetalous flowers with a perianth of two, three, or four trimerous verticils, whose leaves increase in size as they are more internal. In the male flowers is a sort of head formed by the indefinite stamens which are arranged in six vertical rows. Each stamen has a subsessile vertically compressed anther divided into four more or less distinct lobes; it opens by a

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1 MIERS, in *Ann. Nat. Hist.*, ser. 2, 38 (part.); ser. 3, xiv. 97.—B. H., *Gen.*, 34 (*Chondodendron*), 960, n. 4.

2 MIERS admits seven species, all united in one by EICHLER (in *Mart. Fl. Bras.*, *Menisp.*, 167, t. 36, fig. 2).

3 LOUR., *Fl. Cochinch.*, ed. Ulyssip. (1790), 626.—MIERS, in *Ann. Nat. Hist.*, ser. 3, xiii. 487.—B. H., *Gen.*, 960, n. 7 *a*.

4 *F. tinctoria* LOUR., *loc. cit.* — HOOK. & THOMS., *Fl. Ind.*, i. 204.—WALP., *Ann.*, iv. 133.—*Cocculus Fibraurea* DC., *Prodr.*, i. 99. MIERS admits three species in this genus, which are not distinct according to BENTHAM, and reduces to *F. tinctoria* LOUR.

5 DUP.-TH., *Gen. Nov. Madag.*, 18; in *Dict. Sc. Nat.*, v. 266.—DC., *Syst.*, i. 514; *Prodr.*, i. 96.—DCNE., in *Arch. Mus.*, i. 197, t. 13 (fig. *c*).—ENDL., *Gen.*, n. 4699.—H. BN., in *Adansonia*, ii. 316.—B. H., *Gen.*, 39, n. 31; 960, n. 6 *a*.

6 MIERS, in *Ann. Nat. Hist.*, ser. 3, xiii. 490.

7 MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 39; ser. 3, xiv. 51.—B. H., *Gen.*, 34, 960, n. 2.—HOOK. & THOMS., *Fl. Ind.*, i. 181. — WALP., *Ann.*, iv. 123.

8 HOOK. & THOMS., *Fl. Ind.*, i. 180.—B. H. *Gen.*, 33, 960, n. 1. — MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 39; ser. 3, xiv. 52.—WALP., *Ann.*, iv. 123.

9 *Anamirta* COLEBR., in *Trans. Linn. Soc.*, xiii. 52.—ENDL., *Atakt.*, t. 39, 40, n. 4693.—B. H., *Gen.*, 35, 961, n. 9.—MIERS, in *Ann. Nat. Hist.*, ser. 3, xiv. 49.

horizontal cleft. In the female flowers there are only six or nine free staminodes; and the gynæceum formed of three, or more rarely six, carpels resembles *Cocculus*. The fruit consists of several subovoid reniform drupes. Inside the cavity of the stone is a bilobed projection on which the seed is moulded. The horny albumen may be divided into two unequal sheets (fig. 21), between which is lodged the embryo, like that of *Chasmanthera*. *Anamirta* consists of Lianas from Tropical Asia and the Indian Archipelago. Their leaves are large, often cordate at the base. The flowers come out early from the wood of the branches in large pendulous compound racemes (fig. 1). As many as seven species have been admitted.[1]

Anamirta Cocculus.

FIG. 18.
Male flower (3/1).

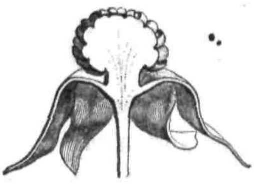

FIG. 19.
Long. sect. of male flower.

FIG. 20.
Fruit (3/1).

FIG. 21.
Long. sect. of fruit.

Coscinium[2] belongs to this series through its embryo with divaricated cotyledons. But these are laciniate and sinuous, and the surrounding albumen is ruminate. The seed is depressed by a stipitate capitate prominence of the stone. The male flowers have six fertile stamens, whereof the outer are free, with one-celled anthers, and the three inner are monadelphous with two-celled anthers. Two species of this genus have been described,[3] natives of Tropical Asia, with large peltate leaves, and with the flowers collected in large numbers on a pedunculate globular capitulum.

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[1] The number given by MIERS. BENTHAM & HOOKER reduce them to one (or two ?). ARN., in *Ann. Sc. Nat.*, sér. 2, ii. 65, t. 3.—WIGHT & ARN., *Prodr.*, i. 446.—MIQ., *Fl. Ind. Bat.*, i. p. ii. 79.—WALP., *Ann.*, iv. 125.

[2] In *Trans. Linn. Soc.*, xiii. 51 (nec ENDL.).—ENDL., *Gen.*, n. 4692.—B. H., *Gen.*, 35, 961, n. 10.—MIERS, in *Ann. Nat. Hist.*, ser. 3, xiii. 125.—*Pereira* LINDL., *Fl. Med.*, 370.

[3] GÆRTN., *Fruct.*, i. 219, t. 46 (*Menispermum*).—HOOK. F. & THOMS., *Fl. Ind.*, i. 178.—ROXB., *Fl. Ind.*, iii. 809.—WALP., *Ann.*, iv. 122.

IV. CISSAMPELOS SERIES.

Cissampelos[1] (figs. 22–30) has diœcious flowers. The males (figs. 22–24) are regular and hermaphrodite and tetramerous, with a double perianth. The outer whorl is a calyx of four valvate sepals, within which is a sort of short cupule of a single piece.[2] The androceum is represented by a short vertical column, expanding above into a discoidal platform; on the rim of this are borne four horizontal anther-cells[3] of transverse dehiscence. The female flower (figs. 27, 28) bears on top of a little club-shaped pedicel, one single unilateral sepal, a small superposed petal,[4] entire or bifid,[5] and a carpel articulated at the base, and consisting of a one-celled ovary tapering above into a style with three stigmatiferous branches or teeth, whereof two are superposed to the petal and sepal (figs. 27, 28). It is on the same side that is found the parietal placenta, which when adult[6] supports a descending subanatropous ovule, whose micropyle looks upwards and away from the placenta. The fruit is a sub-globular or flattened-orbiculate campylotropous drupe, with the cicatrix of the style near its base. Its stone is compressed, tuberculate behind, with hollowed sides, and an imperfect false septum projecting inside, on whose convexity is moulded the horse-shoe-shaped seed, whose linear embryo is surrounded by a fleshy albumen. *Cissampelos* consists of shrubs, usually climbing, rarely humble and erect with alternate, entire or incised leaves. The flowers are small and numerous, forming axillary supra-axillary or lateral fascicled leaves. The male racemes are much ramified, con-

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[1] L., *Gen.*, n. 1138.—J., *Gen.*, 285.—LAMK., *Dict.*, v. 9, Suppl., iv. 299; *Ill.*, t. 830.—SW., *Observ.*, t. 10, fig. 5.—DUP.-TH., in *Journ. Bot.*, ii. 65, t. 3, 4.—DC., *Syst.*, i. 352; *Prodr.*, i. 100.—SPACH, *Suit. à Buffon*, viii. 23.—ENDL., *Gen.*, n. 4695.—B. H., *Gen.*, 37, 962, n. 21.—*Caapeba* PLUM., *Gen.*, 33, t. 29.—ADANS., *Fam. des Pl.*, ii. 357.—*Antizoma* MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 41; ser. 3, xvii. 266.—*Dissopetalum* MIERS, in *Ann. Nat. Hist.*, ser. 3, xvii. 267.

[2] It is sometimes entire, sometimes crenulate, often rather fleshy in consistency. It has been frequently described as a gamopetalous corolla.

[3] These, perhaps, represent only two anther cells; the androceum is generally termed di- or tetrandrous; the cells alternate with the petals; the pollen has the same form as in *Menispermaceæ* in *C. mauritiana* and *orbiculata*, according to H. MOHL.

[4] This has often been termed a sepal, what we describe as such being then regarded as a bract.

[5] Specially bifid with the species from Madagascar, wherefrom MIERS took the type of his genus *Dissopetalum*. Hence the hypothesis that the petal of *Cissampelos*, even when entire, consists of two leaves.

[6] At first there are two ovules; and that which disappears more or less completely may persist even very long in certain species, such as *C. Pareira* (fig. 26).

sisting of numerous cymes. The female inflorescences have each a simple axis; this bears alternate bracts, usually broad rounded, axillary to which the floral pedicels are arranged in two parallel series between the bract and the axis (figs. 25, 26), becoming shorter from within outwards.[1] All the known species[2] inhabit the tropics.

Cissampelos Pareira.

FIG. 22.
Male inflorescence.

FIG. 25.
Female inflorescence.

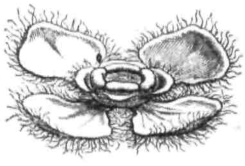

FIG. 23.
Male flower ($\frac{8}{1}$).

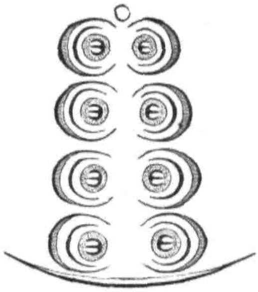

FIG. 26.
Diagram of female inflorescence.

FIG. 24.
Long. sect. of male flower.

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[1] The very singular structure of these flowers, which seem like only parts of a single regular flower each more or less elevated on a branch or division of the floral receptacle, and the position of the placenta relative to the sepal and petal, are facts which deserve the full attention of botanists, especially those who are in a position to observe the organogeny of the female flowers of *Cissampelos*.

[2] MIERS (in *Ann. Nat. Hist.*, xvii. 128) admits sixty-nine, besides five species for *Antizoma* and one for *Dissopetalum*. BENTHAM & HOOKER reduce them to some eighteen.—A. S. H., *Pl. Us. Brasil.*, t. 34, 35; *Fl. Bras. Mer.*, i. t. ii.—DELESS., *Ic. Sel.*, i. t. 98, 99.—GRISEB., *Fl. Brit. W. Ind.*, 10; *Pl. Wright.*, 5.—HARV. & SOND., *Fl. Cap.*, i. 10, 11 (*Antizoma*).—EICHL., in *Mart. Fl. Bras.*, *Menisp.*, 183, t. 43–46.—OLIV., *Fl. Trop. Afr.*, i. 45.—WALP., *Rep.*, i. 96; ii. 749; v. 17; *Ann.*, i. 18; ii. 22; iv. 130.

Next to *Cissampelos* come *Cyclea*[1] and *Stephania*. In the former genus the male flowers have a cornet- or bell-shaped calyx; and the females resemble those of *Cissampelos*, but have two lateral petals instead of one. The genus is composed of Lianas from Tropical Asia.[2]

Cissampelos Pareira.

FIG. 27.
Female flower ($\frac{5}{1}$).

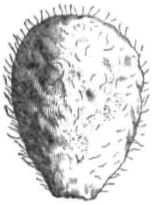

FIG. 29.
Fruit ($\frac{3}{1}$).

FIG. 30.
Long. sect. of fruit.

FIG. 28.
Long. sect. of flower.

Stephania[3] has the female flower of *Cyclea*; but the calyx of the males (figs. 31, 32) consists of from six to twelve free leaves. The androceum though triandrous resembles that of *Cyclea*, being represented when adult by a cylindrical column, at the apex of which is seen a circular platform edged by an apparently single anther,[4] which dehisces by a continuous marginal horizontal cleft. *Stephania* consists of plants from Tropical Asia, Australia, and Africa.[5]

Thus constituted, and containing moreover a large number of doubtful genera,[6] and others whose place in these series is uncertain

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1 ARN., in *Wight Ill.*, 22.—MIERS, in *Ann. Nat. Hist.*, ser. 3, xiv. 17.—B. H., *Gen.*, 38, 963, n. 22.—*Lophophyllum* GRIFF., *Notul.*, iv. 313.—*Rhaptomeris* MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 41.—*Peraphora* MIERS, in *Ann. Nat. Hist.*, ser. 3, xviii. 20.

2 There are eleven species according to MIERS; only three according to BENTHAM & HOOKER.—HOOK. F. & THOMS., *Fl. Ind.*, i. 201.—WALP., *Ann.*, iv. 131.

3 LOUR., *Fl. Cochinch.*, 608.—ENDL., *Atakt.*, t. 49, 50; *Gen.*, n. 4694?—B. H., *Gen.*, 37, 962, n. 20.—*Clypea* BL., *Bijdr.*, 26.—*Ileocarpus* MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 40.—*Homocnemia* MIERS, *loc. cit.*—? *Perichasma* MIERS, in *Ann. Nat. Hist.*, ser. 3, xviii. 21

4 It is always triple when young, and each anther has originally two distinct cells (figs. 31, 32). Later the clefts of the different cells unite by their extremities. BENTHAM & HOOKER have seen the cells distinct in the buds of *S.*? (*Perichasma*) *lætificata*; and they are so even in the adult flower. The same union of the anthers into a double platform with a circular cleft between the two parts occurs in the closely analogous androceum of certain species of *Phyllanthus*.

5 HOOK. & THOMS., *Fl. Ind.*, i. 195.—WIGHT, *Icon.*, t. 939.—BENTH., *Fl. Hongk.*, 13; *Fl. Austral.*, i. 57.—OLIV., *Fl. Trop. Afr.*, i. 46.—WALP., *Ann.*, ii. 21; iv. 129.

6 1. *Adeliopsis* BENTH., *Fl. Austral.*, i. 59.—B. H., *Gen.*, 964, n. 30?—MIERS, in *Ann. Nat. Hist.*, ser. 3, xiii. 125.—H. BN., in *Adansonia*, viii. 153.—Sepals 5–9; 2–4 outer small bract-like. Petals 3, unequal concave, shorter than calyx. Stamens 9–12, central; filaments free,

because all their essential organs are not yet known, this order was established in 1788 by A.-L. DE JUSSIEU, in his *Genera Plantarum*.[1] It included *Leæba* and *Epibaterium* FORSK., which are not distinct genera, *Cissampelos* of LINNÆUS and *Abuta* of BARRÈRE and AUBLET.[2] This

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erect, linear-terete or subcompressed, thickened towards apex, tapering antheriferous at very top; anthers globose didymous; cells sublateral rimose. Female flower: perianth of male. Stamens 0. Carpels 3, free; ovules 2, superposed descending on ventral angle, one subabortive; style rather thick, at apex reflexed, papillose, stigmatose on inner side. A shrub (habit of *Pleogyne*); leaves alternate ovate; flowers in short glomerules along rachis of axillary spikes. (Species 1, Australian: *A. decumbens* BENTH.)

2. *Antitaxis* MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 44.—"Perianth-leaves decussate; petals 2. Stamens 2 in male flower." A doubtful Euphorbiad according to B. H., *Gen.*, 33; but not so according to MUELL. ARG., *Prodr.*, xv. 1258. (Species 3, thereof 1 doubtful from Timor: *A.? longifolia* MIERS.)

3. *Clambus* MIERS, in *Ann. Nat. Hist.*, ser. 3, xviii. 16.—B. H., *Gen.*, 962, n. 21.—Apparently a male specimen of some Mexican *Phyllanthus*, allied to *P. laxiflorus* BENTH. and *P. glaucescens* H. B. K.

4. *Disciphania* EICHL., in *Mart. Fl. Bras.*, *Menisp.*, 168, t. 36.—B. H., *Gen.*, 960, n. 6 *b*?—"Sepals 6, subequal, 2-seriate. Petals 6, much smaller, nearly equal to one another in length, fleshy depressed, united into a 6-gonal-suborbicular disk. Stamens 3, very short, free; anthers subsessile; connective thick, cells subglobose discrete, dehiscing by an introrse vertical lid. Interior rudiment (of inner series of stamens or of gynæceum?) always present, nodular. Female flower and fruit. . . . ?—A shaggy villous climber; leaves broad cordate, 3-lobed; spikes elongated."—(Species 1: *D. lobata* EICHL., which recalling *Jateorhiza* in habit, *Anomospermum* in its petals, is however of very uncertain position, owing to our ignorance of the fruit.)

5. *Penianthus* MIERS., in *Ann. Nat. Hist.*, ser. 3, xiii. 124.—B. H., *Gen.*, 959.—OLIV., *Fl. Trop. Afr.*, i. 50.—Male flowers? . . . . Female flower: calyx 6-leaved; sepals 2-seriate, imbricate. Petals 0. Stamens 6, free; anthers effete. Carpels 3; ovules 2, unequal descending; micropyle superior extrorse; style finally dilated into a ciliate-laciniate horizontal blade. A glabrous shrub; leaves lanceolate acuminate subcoriaceous; flowers in small axillary or supra-axillary pedunculate umbels. (Species 1, from Western Tropical Africa: *P. longifolius* MIERS.)

6. *Pselium* LOUR., *Fl. Cochinch.*, 621.—This genus, distinct according to MIERS, in *Ann. Nat. Hist.*, ser. 3, 371, is in part the same as *Pericampylus* according to B. H., *Gen.*, 37, n. 17 (a very doubtful genus).

7. *Quinio cocculoides* SCHLTL., in *Linnæa*, xxvi. 732 (flowers 5-merous)?? (East Indies).

8. *Rhigiocarya* MIERS, in *Ann. Nat. Hist.*, ser. 3, xiv. 100.—OLIV., *Fl. Trop. Afr.*, i. 47.—The genus is summed up by B. H. (*Gen.*, 960), in these words: "The genus is made from a fragment collected by Barter in Tropical Africa, and preserved in the Hookerian Herbarium. It consists of a leaf, a piece of the inflorescence, and a few drupes of some Menispermad (apparently *Chasmanthera nervosa* MIERS) with two leaves and a twig of a totally different plant, perhaps a species of *Smilax*." (Species 1: *R. racemiflora* MIERS).

9. *Somphoxylon* EICHL., in *Mart. Fl. Bras.*, *Menisp.*, 205, t. 37.—B. H., *Gen.*, 959.—"Sepals 6, 2-seriate; outer smaller, united at base. Petals 6, smaller than sepals, outer concave, united at edges; inner nearly flat. Stamens 3, high-united; anther cells discrete, opening by a vertical cleft.—Quite glabrous. Leaves membranous penniveined. Flowers minute along twigs of a full fascicled panicle." (Species 1: *S. Wullschlægelii* EICHL.)

10. *Syrrhonema* MIERS, in *Ann. Nat. Hist.*, ser. 3, xiii. 124.—B. H., *Gen.*, 959.—OLIV., *Fl. Trop. Afr.*, i. 50.—Male flower: sepals 9–12; 3–6 outermost smaller; inner ones gradually larger. Petals 0. Stamens 3, more rarely 4–6, connate into a tubular column widening out above; anthers included within apex of tube, 4-locellate introrse. Female flower. . . . ?—A tomentose pubescent climber; leaves broadly cordate; flowers pedicellate fascicledal nodes. (Species 1, from the Island of Fernando Po: *S. fasciculatum* MIERS.)

11. *Tripodandra* H. BN., in *Adansonia*, ix. 317, not. 1.—Male flower: sepals 6, subequal. Petals 6, shorter, unequal, rather fleshy, concave inside. Stamens 3, filaments connate at base into a slender column 3-fid, nearly half way down; lobes finally reflexed, at apex passing into a linear fuscate connective; cells 2, lateral adnate, 2-lobed, extrorse vertically rimose. Female flower and fruit. . . . . ?—A climber, with all parts hirsute-tomentose; leaves petiolate ellipsoidal; male flowers crowded on much-branched slender axillary racemes. (Species 1, from Madagascar: *T. Thouarsiana* H. BN.)

[1] 284, Ord. XVII. *Menisperma*. ADANSON (*Fam. des Pl.*, ii. 364) had placed *Menispermum* in his family of the *Anones*.

[2] 1741 and 1775.

group in turn was called *Menispermoideæ*,[1] and *Menispermeæ*,[2] while De Candolle in 1824[3] gave it the name *Menispermaceæ*. In this order he ranged the then known *Lardizabaleæ*, *Burasaia* and *Spirospermum* of Dupetit-Thouars,[4] *Cocculus*,[5] *Pselium*,[6] *Cissampelos*, *Menispermum*, *Abuta*, *Trichoa*, and *Agdestis*,[7] besides *Schizandra* which is a Magnoliad; thus he only knew six of the genera that we now consider as distinct undoubted members of this order. When Endlicher wrote his *Genera*[8] he added *Stephania* of Loureiro,[9] *Coscinium* and *Anamirta*

Stephania hernandifolia.

Fig. 31.
Young male flower ($\frac{5}{1}$).

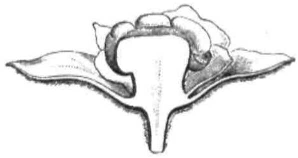

Fig. 32.
Longitudinal section of male flower.

of Colebrooke,[10] besides three genera of *Phytocreneæ*, and *Meniscota* which is a Sabiad. It is to Miers that we owe the most important and conscientious studies on this order of plants, which he has investigated so deeply during twenty-five years,[11] and wherein he has created so many new genera. Among those that we deem it right to retain the following ten are due to this observer: *Tiliacora*, *Anomospermum*, *Pachygone*, *Hæmatocarpus*, *Pleogyne*, *Sciadotænia*, *Tinomiscium*, *Odontocarya*, *Parabæna*, and *Pycnarrhena*; while he shed new light on the genera *Chondodendron* of Ruiz & Pavon,[12] *Calycocarpum* of Nuttall,[13] and *Cyclea* of Arnott.[14] Hochstetter had published the genus *Chasmanthera* in 1844; J. Hooker & Thomson published *Aspidocarya* in 1855. *Sarcopetalum* is due to F. Mueller,[15] *Synclisia* and *Triclisia* to Bentham,[16] *Sychnosepalum* to Eichler.[17] We demon-

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1 Vent., *Tabl.*, iii. 78.
2 Jeaume, *Expos. Fam.*, ii. 82, t. 86.
3 *Prodr.*, i. 95.
4 *Nov. Gen. Madag.*, 18, 19 (1806).
5 Bauh., *Pinax* (1596), 511.
6 Lour., *Fl. Cochinch.* (1790), 621.
7 "Phytolaccacea" (B. H.).
8 825, Ord. CLXXII. (1836).
9 *Fl. Cochinch.* (1790), 608.
10 In *Trans. Linn. Soc.*, xiii. 65, 66 (1821).
11 In *Lindl. Veg. Kingd.* (1846); in *Ann. Nat. Hist.*, ser. 2, vii. (1851), 38; ser. 3, xiii. xiv. xvii.–xix. (1864–68).
12 *Prodr. Fl. Per.* (1794).
13 Ex Torr. & Gr., *Fl. N. Amer.*, i. (1838).
14 In *Wight Ill.*, 22 (1831).
15 *Pl. Indig. Col. Vict.*, i. (1860–62).
16 *Gen.*, 36, 39 (1862).
17 In *Mart. Fl. Bras.*, *Menisp.* (1864).

strated in 1862[1] that *Burasaia* is a true Menispermad, and have recently added the genus *Rameya*;[2] thus completing the tale of thirty genera, besides the uncertain types.

The order contains some hundred and thirty-five species,[3] nearly all tropical. Some few only extend northward in the east of Asia and America, up to 55°. At the south of the Equator a small number are found in South America and the Cape, from 35° to 38° and even as far as 42° in New South Wales. Of the thirty genera that we have given as undoubted members of this order, nineteen belong exclusively to the Old World, and the four genera *Cocculus*, *Cissampelos*, *Menispermum*, and *Pachygone* are found in both Worlds. Hence America possesses only the seven genera *Abuta*, *Anomospermum*, *Calycocarpum*, *Chondodendron*, *Odontocarya*, *Sciadotænia*, and *Sychnosepalum*. Of these, *Calycocarpum* alone is stationed in North America. Of the Old World genera, *Synclisia* and *Triclisia* are confined to Tropical Africa. *Burasaia*, *Spirospermum*, and *Rameya* have only been found in Madagascar and the neighbouring islands of the east coast. *Pleogyne* and *Sarcopetalum* are confined to Australia, and *Coscinium*, *Tinomiscium*, *Aspidocarya*, *Anamirta*, and *Hæmatocarpus* have been observed only in the East Indies. The genera proper to America comprise only a little over one-tenth part of the species contained in the order.

These plants have some characters constant, others that are very rarely wanting. The former are the alternation of the leaves, the diclinism of the flowers, the freedom of the carpels, and the direction of the ovules, which are always descending, with the micropyle upwards and outwards.[4] The latter are the ternary number of the members of the flower-whorls and the multiplicity thereof,[5] the simple leaves,[6] the freedom of the perianth-leaves,[7] and the dicoty-

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[1] In *Adansonia*, ii. 316.

[2] In *Adansonia*, ix. 313 (1870).

[3] MIERS admits a much larger number. "He has enumerated 320 species, ranged in 59 genera; it seems right to reduce the former to 100, the latter to 35." (B. H., *Gen.* 958.)

[4] Probably the originally binary number of the ovules is also constant, but of course this character is irrelevant to the adult state.

[5] In the genus *Antitaxis* MIERS describes a perianth of dimerous verticils. In *Cissampelos* the male flowers are tetramerous, and there is but a single piece in the female flowers to represent either calyx or corolla. In the other *Cissampelideæ* the flowers are no nearer being regularly trimerous.

[6] *Burasaia* is the only genus with compound leaves.

[7] The perianth of *Cissampelos* has been supposed to consist of a double leaf whose parts are

ledonous embryo.[1] These constant or nearly constant characters are those of the order. To split it into tribes or series others have been used, which, though no doubt not unexceptionable, are the only ones at present available in the study of a group usually represented in collections by more or less imperfect specimens.[2] We have hence adopted provisionally the classification proposed by J. HOOKER & THOMSON, based mainly on the structure of the fruit and seed.[3] In certain *Menispermaceæ* the embryo is exalbuminous as in *Pachygone;* in others the albumen envelops it. In *Cocculus* and *Menispermum*, the two cotyledons are applied to one another by the whole extent of their inner faces, while in *Chasmanthera* or *Burasaia* they diverge at their very insertion, leaving an angular space of variable breadth into which the albumen penetrates. Hence we get the three series, *Cocculeæ, Chasmanthereæ,* and *Pachygoneæ;* the fourth series, *Cissampelideæ*, rests on totally different characters, drawn from the structure of the flower and the number of its parts. These are not regularly trimerous.[4] At the same time the androceum consists of stamens which cohere for a certain distance to form a column on top of which the anthers, sessile or subsessile, are united into a sort of terminal cap. The gynæceum is unsymmetrical, reduced to a single unilateral unilocular ovary.[5] We may then sum up the general character of the four series as follows.

I. COCCULEÆ.—Seed with a narrow embryo, whose cotyledons are applied to one another, surrounded by albumen. Drupe with stylar cicatrix subterminal or more frequently brought down near the base of the incurved fruit. Stone with an internal projection of variable form from the ventral angle on which the seed is moulded bowed or inflexed. Carpels 3–6, more rarely 9–12 (8 genera).

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more or less intimately united. This view seems to be purely theoretical. In the other genera, where the perianth leaves are united, some appear to show true gamosepaly, like *Cyclea;* but more commonly the sepals that are united for a certain distance, as in *Synclisia, Tiliacora,* &c., appear merely to stick together by their edges.

[1] Only one cotyledon is well developed in *Rameya* and *Triclisia*. Mr. MIERS informs me that he has shown this in the latter genus, and that the same thing occurs in *Spirospermum*.

[2] Whether because only the male or female plant of a given specimen is there; or while the flowers are well known, the characters of the embryo are unknown; or again, because the only examples are on the contrary fructiferous.

[3] "Distrib. in trib. (forte nimis artificiales) imprim. ad fruct. v. sem. limitat." (B. H., *Gen.*, 30.)

[4] "Flores *non regulariter trimeri.*" (HOOK. et THOMS.)

[5] The top of the style is however usually divided into three branches.

II. Pachygoneæ.—Seed with a fleshy exalbuminous embryo. (All other characters of *Cocculeæ*) (9 genera).

III. Chasmanthereæ.—Seed with a thin albumen, concavo-convex from within outwards, surrounding an embryo with thin foliaceous laterally divaricated cotyledons. (All other characters of *Cocculeæ* and *Pachygoneæ* (10 genera).

IV. Cissampelideæ.—Flowers not regularly trimerous, their anthers united on top of a common column. Carpels solitary excentric (3 genera).[1]

In each of these series the genera are distinguished by the essentially variable characters presented by the total number of verticils of the perianth and androceum, and the presence or absence of a corolla, the definite or indefinite number of the stamens, and their freedom or union, the number of carpels, the form of the fruits, and especially of the stones and their internal projection; the straight curved or hippocrepiform direction of the long axis of the seed and embryo, the form of the albumen and its continuity or segmentation into ruminate lobes; the equality or extreme inequality of the two cotyledons.[2]

The structure of the stems in this order has often been described on account of its great anomalies. The variation often found in matters of detail in passing from one genus to another, do not seem to affect the general type of histological structure usually ascribed to the stems of Menispermads. This structure is such that Lindley was formerly inclined to separate this order from the Exogens, recognising at the same time their striking analogies with those of the Aristolochiads. Decaisne, taking up the study of

[1] These plants might be classed by their male flowers, and this is what Bentham & Hooker have tried to do (*Gen.*, 32). But as yet, not only have as many difficulties been found in rendering these characters practically available as with those drawn from the carpels, but their use is just as artificial. Thus, it is quite certain that to separate, because of the seed-structure, genera with fundamentally similar male flowers, such as *Cocculus*, *Pachygone*, and *Hæmatocarpus*, is a most artificial course. No less so is it, however, to group together from characters taken from the androceum alone, genera differing so widely in the organization of the female flower as, for instance, *Stephania*, *Sarcopetalum*, and *Aspidocarya*. Evidently we should view at the same time both, not merely single characters taken from the flower of one sex alone, but of all those observed in the flowers of both sexes. And this has been done to some extent by Miers who proposes (in *Ann. Nat. Hist.*, ser. 3, xiii. 122) to divide *Menispermaceæ* into seven tribes: 1. *Heteroclineæ* (nearly the same as our *Chasmanthereæ*); 2. *Anomospermeæ* (the single genus *Anomospermum*); 3. *Tiliacoreæ* (which we confine to *Tiliacora* and *Chasmanthera*); 4. *Hypserpeæ* (*Limacia*); 5. *Leptogoneæ* (including *Assampelideæ* and some of the *Cocculeæ*); 6. *Platygoneæ* (formed chiefly of the genus *Cocculus* and its numerous sections which are raised to the rank of genera); and, 7. *Pachygoneæ* (*Pachygone* and *Sarcopetalum*).

[2] Miers thinks, moreover, that the nervation of the leaves in this order may form a differential character of great value.

this question in 1837,[1] found that in *Menispermum canadense*, for instance, a young branch in its first year, while the tissue is still herbaceous, presents the same general organization as that of any other Dicotyledon; but that "this structure, after succeeding years of growth, differs widely from that of other deciduous Dicotyledons. In fact, on observing a two-year-old branch, no new layer is found, but instead of this, an elongation of each vascular bundle whose obovate form is still more marked; at its outer part are still distinguishable the semilunar layer of rudimentary wood, and the layer of liber of the same form. This liber is the same unchanged; but the formerly rudimentary wood is now perfect wood and has produced afresh a layer of cambium. So this mode of growth goes on indefinitely, without the deduplication of any of the fibro-vascular bundles or the addition of any fresh ones, their number remaining unaltered. "Each of these bundles has grown chiefly at its outer parts, to which new fibres and vessels are constantly added. During all this the liber remains stationary, and in a stem of considerable growth only very small bundles are formed outside the segments of the woody zone. In a non-climbing species with persistent leaves, like *Cocculus laurifiorus*, the primitive structure of a young branch is the same, and the fibro-vascular bundles are narrow in proportion to the progressively increasing breadth of the medullary rays. After several years have passed there make their appearance in the cortical parenchyma, outside the first fibro-vascular bundles and alternating with them, an equal number of fresh bundles; these, however, differ histologically, possessing no spiral vessels and having no liber outside them. Later on, a third formation of vessels takes place, alternating with the second, and of identical structure. Thus may further appear in turn a fourth circle, a fifth and so on.[2] The growth of the stem

[1] In *Arch. Mus.*, i.154, t. 10.

[2] TRÉCUL was the first to explain (in *Ann. Sc. Nat.*, ser. 3, xix. 265) the formation of these secondary bundles, saying, "They are the cells at a certain depth in the youngest utricular layer of the bark, which have first enlarged and then been divided by septa." RADLKOFER (in *Flora* (1858), 193; in *Ann. Sc. Nat.*, ser. 4, x. 164) has also referred their origin to a new cambium formed at a certain age "from the innermost cells of the primary bark, or else from these and from their immediately external neighbours." He has also shown that "the secondary vascular bundles are never connected with the leaves."—See also on this question NÆGELI, *Beitr. zu Wiss. Bot.*, i. 16. In this memoir the Menispermads are taken as the type of the Dicotyledons with successive limited zones of cambium in the "protenchyma."

may thus become very uneven, because the later sets of bundles may not, after a certain age, be produced all round a bough, but only on the side where some rather large branch comes off. Hence the appearance of certain old stems whose pith is excentric or even close to one side; because the unilateral development of a large number of woody zones (seen as crescents in transverse section) throws the greater part of the woody body to the same side.[1] *Cissampelos Pareira* is according to DECAISNE organized like *Cocculus*. J. HOOKER & THOMSON[2] have generally confirmed the above facts, and have shown that the structure of the most closely allied types may differ as much as it agrees closely in most widely different genera.[3] The pith may, they say, form from one-fifth[4] to three-quarters[5] of the thickness of the stem, and the number of fibro-vascular bundles varies from twelve[6] to seventy.[7] They are formed of dotted fibres mixed with vessels. The liber bundles are more or less widely separated, and form a crescent of variable curvature in transverse section; but they may be confounded into a continuous zone.[8]

To the above we must add three others, which have been imperfectly indicated, or passed over in utter silence in the study of the Menispermad stems. The zone surrounding the pith is sometimes peculiar. Besides its being often greenish, and of a close dense tissue (which characters often occur in the deep layers of the cortical parenchyma, and in the medullary rays, wherewith it is continuous), it is in *Menispermum* formed of tough elongated elements intermediate in external character between cells and fibres.[9] In the next place, we find in *Anamirta*, for instance, that the fibro-vascular bundles are intermixed with well developed laticiferous vessels, forming long vertical courses in the stem, and filled with a

[1] Hence the strange forms affected by the stems of certain species in transverse section. (DCNE., *loc. cit.*, t. x. fig. 17.—GAUDICH., *Rech. sur l'Organis. . . . des Vég.*, t. 18, fig. 13.—A. RICH., *Elém.*, ed. 7, 154, fig. 86.)

[2] *Fl. Ind.*, i. 177.—OLIV., *Stem in Dicot.*, 4 [in *Nat. Hist. Rev.*, ii. (1862), 300]. The authors of the *Flora Indica* have studied the structure of the stem in sixteen genera, and that usually in specimens of various ages.

[3] Thus *Anamirta* and *Pachygone* resemble *Coscinium* in structure; while *Parabæna* and *Tinospora* are as dissimilar as possible in this point, though closely allied in flower and fruit.

[4] In *Parabæna sagittata*.

[5] In *Aspidocarya*.

[6] In certain species of *Cissampelos*.

[7] In *Coscinium fenestratum*.

[8] The structure of the stems in *Menispermaceæ* has been studied by a very large number of authors.—LINDL., *Introd. to Bot.*, i. 214.—MART., *Gel. Anzeig.* (1842), 387.—GRIFFITH, *Notul.*, iv. 305–319.—H. MOHL, *Ueb. d. Bau. d. Rank. Schlingpfl.* (1827), § 75.—SCHACHT, *Lehrb.*, ii. 57; *Die Pflanzenz.*, 284, t. 19; *Der Baum*, 95, 199.—EICHL., in *Mart. Fl. Bras.*, *Menisp.*, 207, t. 50, 51.

[9] Recalling the elements of fibrous appearance found in the medullary sheath of *Lauraceæ*.

and *Magnoliaceæ*. ADANSON[1] placed them in his family of the *Anonas;* JUSSIEU[2] placed them next in order, like DE CANDOLLE,[3] and BENTHAM & HOOKER.[4] LINDLEY[5] put them between *Schizandreæ* and *Cucurbitaceæ;* ENDLICHER[6] between *Ribesieæ* and *Myristicaceæ;* and J. G. AGARDH[7] between *Piperaceæ* and *Artocarpeæ*, far from the above families, but close to *Monimiaceæ*.[8]

The properties[9] of *Menispermaceæ* are as uniform as their organization; they are usually plants with bitter tonic stomachic juices; more rarely venomous, containing an acrid narcotic toxic latex. The plant that furnishes the Indian-berry (Fr., *Coque du Levant*), or so-called *Cocculus Indicus*, combines these qualities in the highest degree. It is a liana, *Anamirta Cocculus*, from India and the neighbouring regions.[10] Its fruits are used by the natives to stupefy fish; but thus killed they may become a dangerous aliment.[11] They are very bitter, and are hence said to be used in England to give a certain taste to the beer, to the great detriment of the public health.[12] The poisonous principle seems to be confined to the albumen, which contains picrotoxine and a concrete oil composed of elaine and stearine;[13] while the pericarp contains the insipid base menispermine, which though emetic is not poisonous. The root and stem are used in India in fevers, under the name of *Putrawalli;*[14]

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1 *Fam. des Pl.*, ii. (1763), 364.

2 *Gen.*, 285, Ord. XVII.

3 *Syst.*, i. 509; *Prodr.*, i. 95, Ord. V.

4 *Gen.*, 30, 958, Ord. VI.

5 *Veg. Kingd.*, 307, Ord. CIV.

6 *Gen.*, 825, Ord. CLXXII.

7 *Theor. Syst. Pl.*, 241. "*Menispermaceæ* sunt *Dioscoreis*, *Aristolochieis*, *Lardizabaleis*, *Anonaceis*, *Berberideis*, *Schizandreis*, &c., vario mode analogæ, *Monimiaceis* potissimum collaterales, *Piperaceis*, ut videtur, affinitate proximæ et harum formam superiorem constituentes."

8 DE CANDOLLE has also indicated relations with *Sterculiaceæ*. *Dioscoreæ* have often the habit, foliage, and flowers of *Menispermaceæ*. So have the climbing *Phytolaccaceæ*, besides possessing a polycarpellary gynæceum.

9 ENDL., *Enchirid.*, 415. — LINDL., *Veg. Kingd.*, 308.—GUIB., *Drog. Simpl.*, ed. 6, iii. 726.—PEREIRA, *Elem. Mat. Med.*, ed. 4, ii. p. ii. 661.—ROSENTH., *Syn. Plant. Diaph.*, 581.

10 WIGHT & ARN., *Prodr.*, i. 146.—PEREIRA, *op. cit.*, ed. 4, ii. p. ii. 666.—LINDL., *Fl. Med.*, 371.—GUIB., *Drog. Simpl.*, ed. 6, iii. 732.—H. BN., in *Dict. Encycl. des Sc. Méd.*, iv. 95.—*A. paniculata* COLEBR., in *Trans. Linn. Soc.*, xiii. 52.—*A. racemosa* COLEBR., *loc. cit.*, 66 (ex ARN.). — *Menispermum Cocculus* L., *Spec.*, 1468.—*M. lacunosum* LAMK., *Dict.*, iv. 98.—*M. heteroclitum* ROXB., *Fl. Ind.*, iii. 817.—*M. monadelphum* ROXB., *Cat. Merc.*, t. 30.—*Cocculus lacunosus* DC., *Prodr.*, n. 11.—*C. suberosus* DC., n. 12.—*Bacca orientalis*, *Grana Orientis*, *Cocculi indi*, *Cocculæ officinarum*, *Cocculus levanticus* s. *piscatorius* Off.—*Mahezheregi*, *Maheirheza* AVIÇ. (see pp. 1, 15, fig. 1, 18–21).

11 MER. & DEL., *Dict. Mat. Méd.*, ii. 329.

12 PEREIRA (*loc. cit.*, 668) estimates the importation of these fruits into England at 2500 sacks in 1834. [It is to be hoped that the stringent prohibitory clauses of recent Acts of Parliament will stop this most shameful adulteration.—TRANS.]

13 GUIB., *loc. cit.*, 733.

14 This name is also applied to *Cocculus crispus* (p. 30, note 2).

these, like the fruit, when exhibited in proper doses, are an excellent remedy in vomiting and other intestinal affections. The branches are used as a yellow dye.

The two drugs supplied by this order, most extensively used after *Cocculus Indicus*, are *Colombo-root* (Fr., *Racine de Colombo*) and *Pareira-brava*. The former is supplied by *Chasmanthera Columba*,[1] which grows in Madagascar, the east coast of Africa, and the East Indies.[2] It is a tonic subaromatic drug, containing columbine or columbin[3] and berberine, and which seems to be endowed with very active properties; it has been recommended in colic, dysentery, dyspepsia, obstinate sickness, and inertia of the stomach.[4] Its chief succedanea are the roots of *Cocculus flavescens*[5] and *peltatus*.[6] The root *Pareira-brava*, also called *Butua*,[7] comes chiefly from Brazil and the Antilles; but it might be obtained from all the tropical countries where the numerous varieties of *Cissampelos Pareira*,[8] to which it is ascribed, are found. The stem appears to possess, though in a less degree, the properties of the root, which is bitter, sweetish, very diuretic, and mucilaginous, recommended in nephritic colics, and formerly supposed to be an excellent solvent for renal or vesical calculi, and cure for the bites of venomous animals. It is very little used at the present day.[9]

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[1] H. BN., in *Adansonia*, ix. 306 (see. p. 12, figs. 16, 17).—*Jateorhiza Columba* MIERS, *Niger*, 214, not.—*Menispermum Columba* ROXB., *Fl. Ind.*, iii. 807.—*Cocculus palmatus* DC., *Syst.*, i. 522.—GUIB., *op. cit.*, 727.—PEREIRA, *op. cit.*, 661, fig. 106.—LINDL., *Fl. Med.*, 369.

[2] It is said to be cultivated only in India and Madagascar.

[3] The latter is the name used by PEREIRA.

[4] REDI was the first to cite this as an alexipharmic agent in 1675 (*Exp. Circ. Var. res Nat.*, 179).

[5] Synon. according to LINDLEY, of *Anamirta Cocculus* (p. 28, note 10).

[6] Synon. of *Cyclea Burmanni* (p. 30, note 9.)

[7] Probably wrongly. The true Butuas from Brazil and the neighbouring regions are generally species of *Chondodendron*; and the above name seems to be also applied to true Abutas.

[8] L., *Spec.*, 1473; *Cod.*, ed, RICHT., 987, n. 7515.—NEES, *Pl. Off.*, t. 367.—*C. Caapeba* L., *Spec.*, 1473; *Cod.*, loc. cit., n. 7516.—*C. convolvulacea* W., *Spec.*, iv. 863.—*C. pareiroides* DC., *Ess. Méd.*, 78.—*C. orbiculata* DC., *Syst.*, i. 537.—*C. tomentosa* DC.—*C. heterophylla* DC.—*C. microcarpa* DC.—*C. argentea* H. B. K. —*C. guayaquilensis* H. B. K.—*C. orinocensis* H. B. K., *Nov. Gen. et Spec.*, v. 68.—*C. australis* A. S. H., *Fl. Bras. Mer.*, i. 44.—*C. gracilis* A. S. H.—*C. littoralis* A. S. H.—*C. monoica* A. S. H.—*C. Kohautiana* PRESL, *Rel. Hænk.*, ii. 81.—*C. clematidea* PRESL, *Bot. Bem.*, 7.—*C. mucronata* GUILL. & PERR., *Fl. Sen. Tent.*, i. t. 11.—*C. obtecta* WALL., *Cat.*, n. 4981.—*C. hernandifolia* WALL., *loc. cit.*, n. 4977.—*C. acuminata* BENTH.—*C. canescens* MIQ.—*C. apiculata* HOCHST.—*C. nephrophylla* BOJ.—*C. comata* MIERS.—*C. Vogelii* MIERS.—*C. discolor* A. GRAY.—*C. eriocarpa* TR. & PL., in *Ann. Sc. Nat.*, sér. 4, xvii. 42.—*C. glaucescens* TRIANA & PL.—*C. grandifolia* TRIANA & PL.—*C. myriocarpa* TR. & PL.—*C. scutigera* TR. & PL.—*C. subreniformis* TRIANA & PL.—*Cocculus orbiculatus* DC.—*C. membranaceus* WALL. (part.).—*Caapeba* s. *Erva de nossa Senora* v. *Cipo de cobras* MARCGR., *Bras.*, 25.—*Batta-valli*, *Catturalli* RHEED., *Hort. Malab.*, xi. 127. (For the detailed synonymy of this species see EICHLER, in *Mart. Fl. Bras.*, *Menisp.*, 188.)—All the forms of the plant used enjoy the same properties. (GUIB., *op. cit.*, 730.—PEREIRA, *loc. cit.*, 670.—LINDL., *Fl. Med.*, 372.—EICHL., in *Mart. Fl. Bras.*, *Menisp.*, 221.)

[9] From it is extracted cissampeline ($C_{15}H_{21}NO_3$)

Several other Menispermads are or have been used medicinally in hot countries, chiefly as bitter tonics. We may cite the following from India: *Chasmanthera cordifolia*[1] (the *Gualancha*), and *Tinospora crispa*[2] and *malabarica*,[3] belong to the same genus; *Coscinium fenestratum*,[4] *Fibraurea tinctoria*,[5] *Stephania capitata*[6] and *rotunda*,[7] *Pachygone ovata*,[8] *Cyclea Burmanni*[9] and *peltata*,[10] *Cocculus glaucus*[11] and *Leæba*,[12] *Chasmanthera Bakis*[13] and *Cissampelos mauritiana*[14] are used in Tropical Africa for the same purpose, like the species of *Chondodendron*,[15] *Cissampelos ovalifolia*,[16] and several forms of *C. Pareira* and *Abuta ru-*

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or pelosine (WIGG., in *Ann. Pharm.*, xxxiii. 81;—SCHW., *Chem. d. Org. Alk.*, 416), identical with berberine according to FLÜCKIGER.

1 H. BN., in *Adansonia*, ix. 306.—*Cocculus cordifolius* DC., *Prodr.*, i. 97.—*C. convolvulaceus* DC., *loc. cit.* (nec alior.)—*Menispermum malabaricum* β LAMK., *Dict.*, iv. 96.—*M. cordifolium* ROXB., *Fl. Ind.*, iii. 811.—*Tinospora cordifolia* MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 38.—*Goluncha luta* of the Bengalese; *Tippa tiga* of the Cingalese.

2 MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 38.—*Menispermum crispum* L., *Spec.*, 1468.—*M. verrucosum* ROXB.,—*Cocculus crispus* DC.—*C. verrucosus* WALL.—*C. coriaceus* BL., *Bijdr.*, 25. This plant is considered as active a febrifuge as cinchona in Malaysia.

3 MIERS, *loc. cit.*—*Cocculus malabaricus* LAMK.

4 COLEBR., in *Trans. Linn. Soc.*, xiii. 65.—HOOK. & THOMS., *Fl. Ind.*, i. 178.—MIERS, in *Bot. Mag.*, t. 4658; in *Pharm. Journ.*, xii. 85.—*Menispermum fenestratum* GÆRTN.—*Pereiria medica* LINDL., *Fl. Med.*, 370.—*Woniwol, Venivel, Bangwellgetta* of the Cingalese. The root infused in water is the best stomachic known in Ceylon. It contains berberine (GUIB., *op. cit.*, 728).

5 LOUR., *Fl. Cochinch.*, 769.—*Cocculus Fibraurea* DC., *Syst.*, i. 526.—LINDL., *Fl. Med.*, 367. The root is diuretic. The Malays use it mainly in intermittent fevers and disorders of the liver.

6 *Clypea capitata* BL.

7 LOUR., *Fl. Cochinch.*, 747.—HOOK. & THOMS., *Fl. Ind.*, i. 197.—*Cocculus Roxburghianus* WALL.—*C. Finlaysonianus* WALL.—*Cissampelos glabra* ROXB.—*Clypea Wightii* ARN.

8 MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 43.—*Cissampelos ovata* POIR.—*Cocculus brachystachyus* DC.—*C. leptostachyus* DC.—*C. Plukenetii* DC.—*C. Wightianus* WALL. All its parts, especially its fruit (figs. 12, 13), are bitter and tonic.

9 MIERS, in *Ann. Nat. Hist.*, ser. 2, vii. 41.—*Cocculus Burmanni* DC.—*Clypea Burmanni* WIGHT & ARN. (part.).—*Waltiedde* GÆRTN., *Fruct.* ii. t. 180.—LINDL., *Fl. Med.*, 372. The root, besides being used in the treatment of relapsing fevers and diseases of the liver, is employed in dysentery and piles in Malabar.

10 HOOK. & THOMS., *Fl. Ind.*, i. 201.—*Menispermum peltatum* LAMK.—*Cocculus peltatus* DC.

11 ROSENTH., *op. cit.*, 581.

12 DC., *Prodr.*, i. 99.—*C. Cebatha* DC.—*C. Epibatherium* DC.—*Menispermum edule* VAHL. It is the *Leæba* and *Cebatha* of FORSKHAL, wrongly referred to *Euphorbiaceæ* under the name of *Adenochetou*. It is found from Malaysia up to the borders of the Red Sea.

13 H. BN., in *Adansonia*, ix. 306.—*Cocculus Bakis* GUILL. & PERR., *Fl. Sen. Tent.*, i. 12, t. 4.—*Tinospora Bakis* MIERS. The root is very bitter and diuretic. The negroes of Senegal use it in the treatment of fever and urethritis.

14 DUP.-TH., in *Journ. Bot.*, ii. 65, t. 3, 4.—DC., *Prodr.*, i. 101, n. 11. Made by MIERS (in *Ann. Nat. Hist.*, ser. xvii. 267) the type of the genus *Dissopetalum*. This species furnishes the *Pareira-brava* of the Mascarene Islands, possessing the same properties as the American drug. EICHLER makes it a mere variety of *C. Pareira* (p. 29, note 8).

15 *C. tomentosum* R. & PAV. (*Prodr.*, 132; *Syst.*, 261;—*Epibaterium? tomentosum* PERS., *Syn.*, ii. 561;—*Cocculus Chondodendron* DC., *Prodr.*, n. 19), and the other species or varieties of the genus, especially *Cocculus platyphylla* A. S. H. (*Fl. Bras. Mer.*, i. 48; *Pl. Us. Bras.*, t. 42) and *C. cinerascens* A. S. H. (*Fl. Bras., Mer.*, i. 47), bear the vulgar name of *Butua* or *Abutua*, and have the same properties as *Abuta*. *Cissampelos Abutua* VELLOZ. (*Fl. Flum.*, x. t. 140) is a *Chondodendron*.

16 DC., *Syst.*, i. 537; *Prodr.*, i. 102. To this species EICHLER refers the following plants as mere varieties: *C. crenata* DC.—*C. ebracteata* A. S. H., *Fl. Bras. Mer.*, i. 41.—*C. communis* A. S. H.—*C. velutina* A. S. H.—*C. suborbi-*

fescens[1] in America. *Cocculus villosus* is also considered a sudorific in India. The fruits of *C. Leæba* are acrid, but the Arabs eat them, and prepare from them a fermented drink which they name *khumr ool majnoon.* The acid mucilaginous drupes of *Chondodrendron convolvulaceum*[2] are also eaten in Peru, under the name of *Uva del monte.*[3]

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cularis A. S. H.—*C. subtriangularis* A. S. H.—*C. rotundata* POHL.—*C. amazonica* MIERS.—*C. assimilis* MIERS.—*C. vestita* TRIANA & PL., in *Ann. sc. Nat.*, sér. 4, xvii. 44.

1 AUBL., *Guian.*, 618, t. 250.—LINDL., *Fl. Med.*, 373.—ROSENTH., *op. cit.*, 582.—White *Pareira-brava* of Guiana.

2 PŒPP. & ENDL., *Nov. Gen. et Spec.*, t. 190.

3 Several Abuta have been considered poisonous, only because according to MARTIUS (*Reis.*, iii. 1155) they enter into the composition of the Woorali poison. This he says is the case with *A. rufescens* (*Cocculus Pahni* MART.), *A. Imene* EICHL. (in *Mart. Fl. Bras.*, *Menisp.*, 177), and *Cocculus toxiferus* WEDD., whose flowers are unknown, but which belongs to the genus *Abuta* or *Chondodendron.*

GENERA.

I. COCCULEÆ.

1. **Cocculus** BAUH.—Flowers diœcious regular. Sepals free, 6 in 2 series, or more rarely 9–12; outer 3–6 shorter, bract-like; æstivation subvalvate or imbricate. Petals 6 in 2 series, shorter than sepals, concave or involute around the filaments, entire or 2-fid. Stamens 3 (barren in female flower), more rarely increased in number (7–10) in some flowers (*Selwynia*); filaments free; anthers terminal or lateral and subextrorse (*Limacia*), 2-celled, often 4-lobed, 2-rimose. Carpels usually 3, opposite outer sepals, free; ovaries 1-locular; styles varying in form, cylindrical or compressed-dilated, erect or recurved, stigmatiferous; apex attenuate or variously dilated, entire or 2-fid. Ovule solitary (or 2, one smaller and abortive) descending, anatropous; micropyle superior, extrorse. Drupes subrotundate or obovate, rarely elongate (*Diploclisia*), oftener laterally compressed; scar of style a little way from base; putamen arcuate or hippocrepiform, concave on each side and more or less intruded, back tubercular or cristate; each process imperforate (*Pericampylos*) or more or less perforate, intruded inwards on either side and more or less above the base. Seed hippocrepiform; embryo elongate, in the axis of albumen; cotyledons linear appressed. Climbing shrubs; stems sarmentose, or more often twining, woody, or or more rarely subherbaceous; leaves alternate petiolate exstipulate, base entire or more rarely subpeltate or cordate; flowers in simple or more usually branched racemose cymes (*All tropical and subtropical*). See p. 1.

2. **Menispermum** T.—Flowers of *Cocculus*. Stamens 12–∞ (6 sterile in female flowers; anthers terminal, 4-lobed. Carpels 3–6; styles flattened out and dilated; apex stigmatose. Drupes compressed; putamen reniform; outer surface subcristate; each process imperforate, intruded inwards. Seed hippocrepiform; embryo slender; cotyledons appressed.—Leaves broad, often subpeltate, angular or palmately lobate (*Eastern Asia, North America*). See p. 4.

3. **Abuta** Barr.—Flowers almost of *Cocculus*, apetalous; sepals 6–12, in 2–4 series, outer 3–9 small; inner by far the larger, subpetaloid, valvate or slightly imbricate. Stamens 6 (sterile in female flower); outer 3 free; anthers 2-locular; inner 3 free or connate at base, anthers sub-4-lobed. Carpels 3; styles cylindrical recurved. Drupes subovoid; scar of style a little way from base; cavity of putamen divided at centre by a thin erect lamina; seed induplicate on lamina; albumen transversely ruminated; embryo linear, hippocrepiform; cotyledons appressed.—Leaves coriaceous, 3–5-nerved to base; flowers in subsimple (female) or branched (male) racemose cymes (*Tropical America*). See p. 5.

4. **Spirospermum** Dup.-Th.—Perianth almost of *Cocculus*. Stamens 6; filaments free thickened at apex; anthers underneath apex, vertical, subintrorse, dehiscence longitudinal submarginal. Female flower. . . ? Drupes 3–9, shortly stipitate, orbiculate-circinate, compressed; scar of style a little removed from base; putamen thin. Seed smooth, spirally involute; albumen little; embryo shorter than seed, linear, incurved-circinate; cotyledons appressed (one smaller, subabortive ?) shorter than radicle.—Climbing shrubs, leaves oblong glabrous coriaceous; inflorescence elongate; branches pendulous thin compound in male plants; thicker simple in female (*Madagascar*). See p. 6.

5. **Tiliacora** Colebr.—Sepals 6–9; outer 3–6 in 1, 2 series, small, bract-like; inner 3 much larger subpetaloid, valvate or slightly imbricate. Petals 6 in 2 series, small, cuneate, subcordate. Stamens 6, in 2 series; filaments erect, free; anthers elongate, introrse, 2-celled. Perianth of female flower similar to male. Carpels 6–12; styles short subulate. Drupes ∞, stipitate; stalks connate at base; pericarp long-obovate, with a very short spur at base, laterally compressed; scar of style very near base; putamen smooth sulcate. Seeds uncinate-incurved; albumen ruminated; embryo almost as long as seed; cotyledons appressed.—Stems climbing; leaves ovate; inflorescence elongate (*Tropical Asia, East Tropical Africa* ?). See p. 6.

6 ? **Synclisia** Benth.—Male flower. Sepals 9; outer 6, short

bract-like in 2 series; inner 3 much longer, connate high up into a long conical bud, valvate; apex alone free. Petals 6, minute, orbicular-glanduliform, in 2 series. Stamens 6–10, filaments connate at base, clavate, erect; anther-cells sublateral, adnate a little beneath apex, longitudinally rimose. Female flower and fruit. . . . ? —Stems and branches slender; leaves cordate 5-nerved, pilose with red or brownish hairs. Male flower axillary; pedicles slender solitary or more seldom in pairs (*Tropical West Africa*). See p. 6.

7. **Anomospermum** MIERS.—Sepals, outer 3 small; inner 3 alternate, much larger, thick fleshy orbicular imbricate. Petals 6, in 2 subequal series, each folded round the superposed stamen, thick fleshy, with very incurved margins. Stamens 6, free, wanting or sterile in female flower, slender, longer than petals in male; anthers introrse, 2-celled, 2-rimose. Carpels 3, free; style very short, at once expanding into a wide stigmatose head spreading downwards. Drupes oblong, straight; scar of style terminal; a straight ventral vertical thin lamina intruded within putamen. Seed oblong straight, traversed by a groove receiving lamina of putamen; albumen strongly ruminated, incompletely septate transversely; embryo (almost as long as albumen) terete or slightly compressed, straight; cotyledons appressed, radicle superior.—A climbing shrub, leaves simple, coriaceous, entire, oblong-acute; male flowers in solitary or fasciculate racemes; female flowers solitary or subsolitary (*Tropical America*). See p. 6.

8. **Sarcopetalum** F. MUELL.—Sepals 6, or more rarely 3–5, unequal, 2-seriate. Petals 3–6, longer than calyx, thick fleshy, unequally obovoid, or obpyramidal, narrowed at base, depressed or subglobose and subrugose above. Stamens 2–4, inserted on erect column; apex with 2–4 slightly divaricating lobes; anther-cells adnate, horizontally parallel. Female flower: Perianth of male. Carpels 3–6; styles reflected; apex 2–3-lobed. Drupes compressed; cicatrix of style scarcely removed from base. Putamen seed and albuminous embryo of *Cocculus*.—Stems climbing, leaves broad, cordate at base; flowers in simple lateral solitary or fasciculate racemes (*Australia*). See p. 7.

II. PACHYGONEÆ.

9. **Pachygone** MIERS.—Flowers of *Cocculus*. Carpels 3; styles somewhat thickened. Drupes reniform or subglobose, more rarely oblong compressed (*Hyperbæna*); scar of style scarcely removed from base; putamen slightly excavated on either side; process intruded. Seed hippocrepiform, exalbuminous. Embryo thick fleshy; radicle short; cotyledons semicylindrical.—Leaves ovate or oblong, subcoriaceous. Flowers in cymiferous racemes (*Asia, Tropical America*). See p. 7.

10. **Hæmatocarpus** MIERS. — Flowers almost of *Pachygone;* sepals 9–15, in 3–5 series; the inner gradually larger. Petals 6. Stamens 6, free, irregular, with apex more or less incurved, clavate; anther-cells lateral. Female flowers. . . ? Drupes large, ovoid, smooth; cicatrix of style slightly removed from base; endocarp thin; process intruded. Seed hippocrepiform; exalbuminous embryo of the same form, suberose-fleshy.—Leaves coriaceous, ovate or oblong; petiole thickened at base and apex, flowers in branched cymiferous racemes (*East India*). See p. 8.

11. **Pycnarrhena** MIERS.—Sepals 6, in 2 series, concave. Petals 6, in 2 series, subsimilar, much smaller. Stamens about 9, approximated into a short mass nearly flat at summit, or else distinctly free at base; anthers erect; cells confluent at apex, dehiscing by 2 longitudinal slits. Female flower. . . ? Drupes 3, reniform, somewhat laterally hollowed; process of thin putamen scarcely intruded; scar of style lateral; embryo incurved; radicle very short; cotyledons thick. — Stems climbing; leaves oblong penninerved; inflorescence either short and densely crowded, or lax and slender pedunculate, collected in axils of leaves or at old nodes (*East India, Borneo*). See p. 8.

12. **Chondodendron** RUIZ & PAV.—Sepals 9–12, or more rarely 15–18, in 3 rows, gradually enlarging from base; inner 3 sometimes thickened at margin a little above base, subpetaloid, apex reflexed. Petals 6, in 2 series, either shortly orbicular, or elongated and much narrowed at base. Stamens 6 (sterile in female flower), free or connate at base; filaments inflexed at apex; connective

incurved, apiculate; anthers basifixed; cells lateral, rimose. Carpels, 3–6; styles. . . ? Drupes stipitate, suboval; scar of style slightly removed from base; lamina of putamen intruded from base. Seed hippocrepiform; embryo exalbuminous thick; cotyledons semi-cylindrical fleshy.—Stems climbing; leaves large, 5-nerved at base; racemes subsimple; sparsely branched, or more usually (male) much branched, axillary, or coming laterally from the wood (*Tropical America*). See p. 8.

13. **Sychnosepalum** EICHL.—Sepals ∞, in 3–∞ series, gradually enlarging from base. Petals 6, in 2 series; smaller than inner sepals, concave. Stamens 6 (3–6 sterile in female flower), either all connate at base, or inner 3 markedly 1-adelphous; outer free, shorter; cells of 3 inner anthers lateral or extrorse, rimose; outer anthers usually smaller, introrse. Carpels 6, united at base; styles connivent into column; stigmas short spreading. Drupes united at base, outer surface convex; scar of style a little way from base; process intruded from base of endocarp. Seed exalbuminous? Embryo. . . ? — Stems climbing, tomentose; leaves coriaceous, 3–5-nerved; flowers in racemes or simple or branched spikes (*Tropical South America*). See p. 8.

14. **Sciadotænia** MIERS. — Male flower. . . ? Sepals of female flower 9–12, in 3–4 series; outer smaller, bract-like; inner 3 much larger, erect, valvate. Petals 6, in 2 series, membranous, oblong. Stamens 6, sterile; outer 3 lengthened, often thickened at apex into a sterile anther; 3 smaller or wanting. Carpels ∞ sessile, collected into a sphere, mutually much compressed; ovules 2, one small sterile; style slender, glabrous, reflexed. Drupes 6–12, long stipitate; stalks clavate, connate at base; pericarp subglobular compressed; scar of style slightly removed from base; process of thin putamen intruded. Seed hippocrepiform; embryo thick, fleshy, albuminous. — Stems climbing, leaves ovate-acuminate, 3–5-nerved at base, veined transversely; female flowers solitary axillary; peduncle long slender nutant (*Guiana*). See p. 9.

15. **Pleogyne** MIERS.—Sepals 7–9, in 3 series; outer 4–6 small or subulate, bract-like, imbricate; inner 3 larger, apex recurved

spreading, valvate. Petals 6, in 2 series, short involute. Stamens 3, central, alternating with inner sepals; filaments free terete subreflexed with thickened apex; anthers small, nearly didymous; 2-rimose. Female flower. . . ? Drupes 3–6, reniform; scar of style lateral; putamen scarcely hollowed; intruded process 0. "Seed reniform attached by centre of side; embryo exalbuminous, reniform; cotyledons thick, almost conferruminate; radicle hardly distinguishable."—Climbing shrub; leaves ovate; flowers in short branched axillary racemes (*East Subtropical Australia*). See p. 9.

16. **Triclisia** Benth.—Sepals 6–15, in 2–5 series; outer imbricate, gradually increasing in size towards inner ones; inner 3–6, larger, subpetaloid, valvate. Stamens 3 or 6, incurved at apex; anthers lateral or subintrorse, 2-locular, rimose, apex muticous or apiculate. Female flower. . . ? Drupes 3 (?)–∞, nearly straight or scarcely reniform; scar of style lateral; putamen scarcely hollowed; process intruded, small; embryo of similar shape, exalbuminous, thick, fleshy; cotyledons very unequal, one minute subabortive, the other very thick, subcylindrical, slightly incurved.—Leaves ovate orbiculate or cordate. Flowers in axillary or lateral cymes either short and densely crowded or laxer with many flowers (*West Tropical Africa*). See p. 9.

17. **Rameya** H. Bn.—Male flowers. . . ? Perianth of female flowers of . . . unequal leaves. Stamens linear. Carpels ∞, globose-capitate; ovule 1, arcuate; style slender, linear subulate. Drupes ∞, stipitate obovate-compressed hippocrepiform; scar of style a little way from base; process of putamen intruded from base. Seed uncinate-incurved, induplicate on lamina, exalbuminous. Embryo of similar shape; cotyledons markedly unequal; the smaller abortive, the larger hippocrepiform, fleshy, thick.—A climbing shrub; leaves alternate subcoriaceous 3-ribbed at base; flowers inserted on the wood; female flowers few subcymose (*Madagascar*). See p. 10.

III. CHASMANTHEREÆ.

18. **Chasmanthera** Hochst.—Flowers almost of *Cocculus*; sepals usually 6, in 2 series. Petals 6, much smaller, concave. Stamens 6

(sterile in female flower), either free (*Tinospora*, *Colombo*), or more or less strongly 1-adelphous (*Euchasmanthera*, *Jateorhiza*); anthers extrorse, lateral or subterminal; cells 2, rimose, more or less confluent at apex. Carpels 3 (of *Cocculus*), styles narrow or dilated, divided. Drupes destitute of prickles or aculeate, smoother within, marked by cicatrix of style a little under apex; putamen concave within; process hemispherical or semi-ovoid, intruded, leaving an empty false-cell. Seed meniscoid, convex outwardly; albumen of same shape, fleshy, more or less ruminated or subcontinuous; embryo incurved; radicle superior cylindrical; cotyledons membranous, divaricating laterally on each side between the laminæ of albumen.—Stems climbing, smooth or pilose-aculeate; leaves alternate cordate at base, entire or palmatilobate, rarely heteromorphous; flowers in simple or branched racemes; male inflorescence more branched (*Asia*, *Australia*, *Tropical Africa*). See p. 11.

19. **Calycocarpum** Nutt.—Sepals 6, subequal, thin, in 2 series. "Petals 6, somewhat flattened." Stamens 6–10 (6, sterile in female flower), free; anthers basifixed introrse; cells vertical, longitudinally rimose. Carpels 3; styles lacerated; apex stigmatose. Drupes unequally ovoid, rather flat within; scar of style subterminal; putamen concave within; process intruded hemispherical. Seed meniscoid, markedly concave within; albumen thin; embryo of *Chasmanthera*.—Stems climbing, leaves palmatilobate, cordate at base; flowers in narrow composite racemes (*North America*). See p. 13.

20. **Tinomiscium** Miers.—Sepals 6–9; outer 3 smaller, bract-like. Petals 6, a little shorter than sepals, suborbicular erect. Stamens 6, free, attenuate at base, clavate and expanded behind at subincurved apex, subcarinate inside; anther-cells lateral at apex. Female flower. . .? "Drupes ovate-oblong, very compressed; scar of style terminal; putamen with a flat surface; lamina intruded, projecting a little." Seed. . .?—Leaves often large, coriaceous, 3–5-nerved at base; flowers in lengthened simple or sparsely branched racemes (*Tropical Asia*). See p. 13.

21. **Odontocarya** Miers.—Flowers almost of *Chasmanthera*; 3 inner sepals thinner. Petals 6; shorter, somewhat flattened.

Stamens 6, filaments united more than halfway up the middle; anthers erect terminal; cells extrorse parallel. Female flower: "Carpels 3; stigma foliaceous, deflexed." Drupes ovoid, somewhat compressed from the outer surface; scar of style subterminal; putamen filamentous or woolly outside, with a hollowed surface; process intruded, oblong, hemispherical. Seed meniscoid; albumen fleshy; cotyledons divaricating.—Leaves cordate or hastate. "Flowers in simple slender elongated subfasciculate racemes" (*Tropical America*). See p. 14.

22. **Fibraurea** Lour.—Sepals 9; outer 3 small, bract-like; inner layer subequal. Petals 0. Stamens 6 (sterile in female flower), free, attenuate clavate about the incurved apex; anther-cells adnate at apex, diverging below. Carpels 3; stigmas excentric, small. Drupes oblong, somewhat compressed; scar of style terminal; surface of putamen sulcate; process high-intruded. Seed similar in form, surface hollowed; albumen ruminated.—Leaves ovate or oblong coriaceous 3-nerved. Flowers in very much branched racemes, solitary pedicellate on branches (*Malaysia, Indian Archipelago*). See p. 14.

23. **Burasaia** Dup.-Th. — Sepals 6–15, in 2–5 series; outer smaller, bract-like. Petals 6, smaller, oblong-ovate. Stamens 6 (sterile in female flower); filaments short, connate at base; anthers longer, 2-celled; cells introrse subparallel close to apex. Carpels 3; styles foliaceous, reflexed; apex shortly 2-fid. Ovules 2; smaller abortive. Drupes unequally ovoid, scarcely compressed; scar of style terminal; putamen straight, filamentous-woolly outside, surface longitudinally sulcate; process intruded, obtuse. Seed of the same form as its situation, surface more or less hollowed; albumen fleshy, abundant, ruminated; cotyledons membranous, flattened, divaricate. — Feeble shrubs; leaves alternate long-petiolate 3-foliolate coriaceous; flowers in axillary few-flowered racemes (*Madagascar*). See p. 14.

24. **Parabæna** Miers.—Flowers almost of *Chasmanthera;* sepals 6; petals 6, shorter obovate or 3-lobed. Stamens (sterile free in female flower) united into a central column; anthers 6 coalesced

into a terminal subglobose head, dehiscing transversely. Carpels 3; styles subulate, recurved. Drupes ovate; scar of style subterminal; putamen tuberculate on outer surface, rostrate above, deeply hollowed within; process intruded hemispherical. Seed meniscoid; albumen fleshy homogeneous; embryo curved; radicle long; cotyledons ovate, laterally divaricate.—Leaves sagittate. Flowers in axillary dichotomous cymes (*India*). See p. 14.

25. **Aspidocarya** Hook. & Thoms. — Flowers of *Parabæna;* sepals 6–12, in 2–4 series; inner ones wider. Petals 6, shorter, cuneate. Stamens 6, united into a peltate column; anthers horizontal, sessile at margin. Carpels 3; styles short, subcapitate. Drupes compressed from the back; scar of style subterminal; putamen carinate at back; flattened within, scarcely intruded. Seed oblong, conspicuously marked inside by raphe; albumen fleshy; embryo inverted; radicle short; cotyledons flattened, divaricate at base, parallel at apex.—Leaves cordate or subpeltate. Flowers in branched elongated racemose cymes (*Himalaya*). See p. 14.

26. **Anamirta** Colebr.—Sepals 6, in 2 series, or 9–12; outer 3–6 much smaller, bract-like. Petals 0. Stamens (6–9, sterile, free, in female flower) ∞; anthers capitate 6-seriate on top of a short vertical column, crowded and compressed, 4-lobular, horizontally rimose. Carpels 3 (rarely 4–6); stigmata subcapitate. Drupes stipitate, obliquely ovate-reniform; scar of style a little way from base; putamen woody, glabrous; process intruded within, strongly 2-lobed. Seed externally subglobose, hollowed within; albumen subcorneous (scattered in farinaceous lumps); embryo incurved; radicle cylindrical superior; cotyledons very thin, divaricating, shorter than albumen.—Stems climbing; leaves large, usually cordate at base; flowers in elongated branched racemes hanging from the older branches (*Tropical Asia*). See p. 15.

27. **Coscinium** Colebr.—Sepals 9, in 3 series, inner larger, subpetaloid. "Stamens 6 (sterile in female flower); outer 3 free; anthers 1-celled; inner connate as far as middle; anthers 2-celled. Carpels 3–6; styles subulate, recurved." Drupes subglobose; putamen bony; process intruded near base, stipitate and peltate.

Seed subglobose, hollow within; albumen ruminated, fleshy, oily, embryo almost straight; radicle small; cotyledons divaricate, deeply laciniate.—Stems climbing; leaves large peltate; flowers capitate; capitula globose pedunculate (*Tropical Asia*). See p. 15.

IV. CISSAMPELIDEÆ.

28. **Cissampelos** L.—Flowers diœcious. Calyx of male 4-leaved, valvate. Corolla (?) short, cupuliform, subentire or crenate. Stamens connate into a short peltate column at apex; anther-cells 4, sessile at margin, transversely rimose. Female flower unsymmetrical; sepal 1 ("bracteole") unilateral; petal 1, opposite sepal, entire or 2-fid. Carpel 1, excentric, free; ovary 1-celled; ovules 2 inserted on placenta placed before petal and sepal; one hemitropous, descending; micropyle superior; other minute abortive, or even 0; style 3-dentate or 3-fid; lobes 2-fid. Drupes subglobose or obovoid, very hippocrepiform; scar of style a little way from base; putamen campylotropous compressed, tuberculate at back; hollowed on each side; process intruded. Seed hippocrepiform; albumen fleshy, delicate; embryo linear; cotyledons oppressed.—Shrubs or undershrubs, climbing or rarely erect; leaves alternate, varying; male flowers in much-branched cymes; female flowers in often shorter cymiferous racemes; inflorescences small, usually fascicled at axils of rounded bracts; or more rarely cymes of either sex short and few-flowered (*Throughout the Tropical Region*). See p. 16.

29. **Cyclea** ARN.—Sepals of male flowers 4–8 united into a campanulate tubular or inflated-globose calyx. Petals as many, more or less united. Stamens connate at apex into a central peltate column; anthers as many as sepals, adnate at margin, 1-locular and transversely rimose. Calyx of female flower with one sepal; petals 2 lateral. Carpel 1; style 3–5-fid. Drupes ovoid or subglobose; scar of style a little way from base; putamen tuberculate at back; process intruded from either side, enclosing 2 spurious cells. Seed hippocrepiform; embryo sparsely albuminous; cotyledons appressed.—Leaves peltate or cordate; flowers in much-branched racemes (*Tropical Asia*). See p. 18.

30. **Stephania** Lour.—Sepals of male flower free, 6–12, in 2 series. Petals 3–6, shorter, thick, somewhat fleshy. Stamens connate at apex into a peltate column; anthers sessile at margin, at length confluent into a horizontal ring. Sepals of female flower 3–5. Petals of male. Carpel 1 (of *Cyclea*). Drupe of *Cyclea;* putamen hollowed on either side; process perforate, intruded. Seed of *Cyclea.*—Leaves usually peltate. Flowers in simple or composite umbels (?) (*Asia, Tropical Australia*). See p. 18.

XIV. BERBERIDACEÆ.

I. LARDIZABALA SERIES.

In the genus *Lardizabala*[1] (figs. 33–36) the flowers are regular and diœcious. On the narrow convex receptacle are inserted the calyx and corolla, both double and trimerous. The sepals are large, rather fleshy, valvate or subimbricate in the bud. The petals are much smaller, and taking them as a whole, each superposed to a sepal. The same is the case with the six stamens, whose filaments

Lardizabala biternata.

FIG. 33.
Male flower ($\frac{2}{1}$).

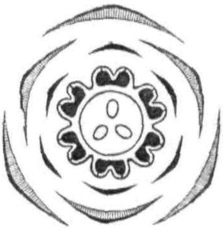

FIG. 34.
Diagram of male flower.

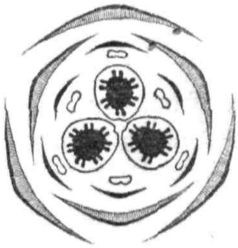

FIG. 35.
Diagram of female flower.

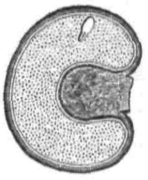

FIG. 36.
Long. sect. of seed ($\frac{2}{1}$).

are united into a vertical tube, on top of which are inserted six extrorse two-celled anthers, of longitudinal dehiscence, and each surmounted by an acute prolongation of the connective.[2] In the bottom of the androceal tube are seen three little rudimentary carpels. The perianth is the same in the female flowers as in the males; but the stamens are small and free, with sterile anthers. The gynæceum consists of three[3] free carpels superposed to the outer sepals, and each formed of a one-celled ovary tapering at the top and sur-

[1] RUIZ & PAV., *Prodr. Fl. Per.*, 143, t. 37; *Syst.*, i. 286.—DC., *Syst.*, i. 511; *Prodr.*, i. 95.—DCNE., in *Arch. Mus.*, i. 187, t. 11 A.—ENDL., *Gen.*, n. 4703.—MIERS, in *Ann. Nat. Hist.*, ser. 3, ii. 190, 431.—B. H., *Gen.*, 42, n. 1.—*Cogylia* MOL., *Sagg.*, ed. 2, 300.—*Boissiera* DOMB., mss.—*Thouinia* DOMB., mss. (ex ENDL.).

[2] In the genus *Lardizabala*, as in *Lardizabaleæ* generally, the pollen grains are elongated with three equidistant longitudinal grooves.

[3] There may be four or only two; I have once seen six in two whorls, the three inner being smaller, in *L. biternata*.

mounted by an elongated cone covered with stigmatiferous papillæ. The walls of the ovary bear a variable number of anatropous ovules[1] inserted all over the inner surface, and arranged a few together (four to eight) in distant vertical rows. The ovarian wall is more or less thickened and prominent between these rows.[2] The fruit consists of from one to three elongated, many-seeded berries. The seeds are reniform, with a deep broad ventral cavity into which the thickened funicle is inserted. Beneath the triple integument[3] is a hard subcorneous albumen, bowed and very concave on the ventral side; near its organic apex is seen a very small oblique excentric cavity, in which is lodged a minute embryo, with a conical radicle more thickened than the cotyledons (fig. 36).

Under the name of *Boquila*[4] has been distinguished a *Lardizabala*,[5] with a thinner perianth than in the other species, whose anthers are muticous or obtusely apiculate, and whose carpels usually contain only two lateral rows of ovules.[6] It can only be made a section of the genus *Lardizabala*. This will then include three or four species,[7] climbing shrubs from Chili and Peru. Their leaves are alternate, trifoliolate, or bi- or tri-ternate, usually with broad lateral stipules at the base. The flowers form axillary racemes, usually reduced to a single flower on the female plant.

Next to *Lardizabala* come three Asiatic genera which differ therefrom but slightly. *Parvatia*,[8] of which only one Indian[9] species is known, has monœcious flowers and very numerous ovules scattered over the

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[1] With two coats.

[2] The thickening is due to the interior cells of the carpellary leaf, which enlarge between the ovules, finally forming a sort of soft pulpy matrix, wherein they are, as it were, framed.

[3] In those of *L. biternata* are distinguished an epidermic layer, a brown, smooth, shelly layer, and a rusty internal membrane, which is soft and almost corky.

[4] DCNE., in *Arch. Mus.*, i. 188, t. 11 B.—ENDL., *Gen.*, n. 4704.—B. H., *Gen.*, 42, n. 2. ("Should it not rather be held a sect. of *Lardizabala*?")

[5] *L. trifoliolata* DC., *Syst.*, i. 513.—DELESS., *Ic. Sel.*, i. t. 92.—DCNE., *loc. cit.*, 189.—*L. discolor* KZE. & PŒPP., *Nov. Gen. et Spec.*, ii. 64, t. 189.—*Pilpil Boquil, Boquil blanco* of the Chilians.

[6] There are usually from three to five in each row. Their chalaza looks towards the median line of the ovary, and the hilum and micropyle towards the lateral walls. Hence we have not here a placentation that really corresponds with the junction of the edges of the carpel in the ventral angle, as in *Decaisnea*. This is merely a *Lardizabala* with the number of rows of ovules more reduced than in the other species.

[7] VENT., *Voy. de Lapérr.*, iv. 265, t. 6–8.—DELESS., *Ic. Sel.*, i. t. 91, 92.—MIERS, *loc. cit.*; *Contrib.*, i. 152–155, t. 28.—C. GAY, *Fl. Chil.*, i. 68.—HOOK., in *Bot. Mag.*, t. 4501.—PŒPP. & ENDL., *Nov. Gen. et Sp.*, ii. t. 189.—WALP., *Rep.*, i. 99 (*Boquila*); *Ann.*, ii. 22; iv. 142.

[8] DCNE., in *Arch. Mus.*, i. 190, t. 12 A.—ENDL., *Gen.*, n. 4702.—HOOK. & THOMS., *Fl. Ind.*, i. 214.—B. H., *Gen.*, 42, n. 3.

[9] *P. Brunoniana* DCNE., *loc. cit.*—WALP., *Ann.*, iv. 140.—*Stauntonia Brunoniana* WALL., *Cat.*, n. 4952.

lateral walls of the ovary.[1] *Decaisnea*,[2] also a monotypic Indian genus,[3] has apetalous flowers, with the ovules forming two vertical rows[4] in the ventral angle of the ovary and pinnate leaves. Two species of *Stauntonia*[5] have been described, one Indian, the other Chinese:[6] both have digitate leaves, monœcious apetalous flowers, monadelphous stamens, and the ovules inserted as in *Parvatia;* but their berries open ventrally instead of remaining indehiscent.

Holbœllia latifolia.

FIG. 37.
Inflorescence.

Holbœllia[7] (figs. 37–40) is closely analogous with *Stauntonia,* though easily distinguished by the complete freedom of the stamens. The six sepals are large and valvate. The petals are small,[8] superposed to the sepals. The anthers, rudimentary in the female flowers, are two-celled and extrorse in the males. The latter flowers have only a rudimentary gynæceum; in the former each carpel contains a large number of ovules attached all over its walls. The fruit consists of indehiscent berries, whose seeds are lodged in thick fleshy pulp. The two known species[9] of this genus inhabit the Himalayas. They are Lianas

[1] They are arranged nearly as in *Akebia,* but over a smaller area, and are the younger as they approach the dorsal angle of the ovary. A mucilage formed of softened cells enframes them more or less completely.

[2] HOOK. F. & THOMS., *Fl. Ind.,* i. 212.—B. H., *Gen.,* 42, n. 4.

[3] The only known species is *D. insignis* HOOK. F. & THOMS.—HOOK. F., *Ill. Himal. Pl.,* t. 10.—WALP., *Ann.,* iv. 140.—*Slackia insignis* GRIFF., *It. Not.,* 187, n. 977.

[4] They have two coats; those of either row have their raphes turned towards the other. They are younger in order from above downwards.

[5] DC., *Syst.,* i. 513; *Prodr.,* i. 96.—DCNE., in *Arch. Mus.,* i. 191, t. 11 C.—ENDL., *Gen.,* n. 4701.—B. H., *Gen.,* 42, n. 5.

[6] THUNB., *Fl. Jap.,* 149 (*Rajania*).—SIEB. & ZUCC., *Fl. Jap.,* i. t. 76.

[7] WALL., *Tent. Fl. Nepal.,* 23, t. 16, 17.—DCNE., in *Arch. Mus.,* i. 193, t. 12 B.—HOOK. F. & THOMS., *Fl. Ind.,* i. 213.—B. H., *Gen.* 42, n. 6.

[8] They are triangular and depressed, almost resembling short glands, especially in the female flowers, but to question their existence is a mistake.

[9] *Bot. Reg.* (1846), t. 49.—WALP., *Ann.,* iv. 41.

with digitate, 3–9-foliolate leaves, and monœcious flowers grouped in axillary racemes (fig. 37).[1]

Holbœllia latifolia.

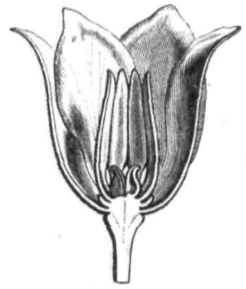

FIG. 38.
Long. sect. of male flower.

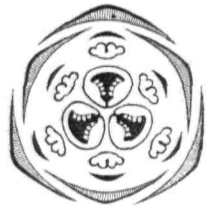

FIG. 39.
Diagram of female flower.

FIG. 40.
Long. sect. of female flower.

The genus *Akebia* (figs. 41–45)[2] is the least regular in this series. The monœcious flowers lack a corolla, and though often possessing three valvate coloured sepals, may have as many as six. The androceum is formed of a variable number of stamens; there are very often six, three superposed to the sepals and three alternating; but this number is frequently increased or diminished. They are free and club-shaped, bearing on their upper dilated part two linear extrorse cells of longitudinal dehiscence.[3] The gynæceum is rudimentary in the male flowers, like the stamens in the females. But these latter possess a variable number of carpels (from three to twelve), which are free, each consisting of a multiovulate ovary,[4] surmounted by a short style with a dilated stigmatiferous apex. The fruit is formed of large berries opening like follicles by an

[1] They are placed at the base of the young twigs, axillary to the scales or undeveloped leaves on the lower portion thereof. Higher up are well-developed leaves, with only leaf buds in their axils. The racemes are ebracteate; only the axis is slightly swollen around the insertion of the floral pedicel, which is articulated here. The racemes bear only male or only female flowers, or else a few females at the base, with males above (fig. 37).

[2] DCNE., in *Arch. Mus.*, i. 195, t. 13, A, B.—ENDL., *Gen.*, n. 4791 b.—B. H., *Gen.*, 42, n. 7.

[3] The pollen consists of whitish elongated grains, bearing from one to three longitudinal grooves.

[4] The ovules have coats, and some become finally anatropous, but most of them are hardly quite so, or even retain the original orthotropy that they have when the embryo sac already forms a well-developed cavity in the nucleus. They are inserted on the right and left walls of the ovary, decreasing in age as they are more distant from the ventral angle, where they first appear, as in *Holbœllia*. The pulp surrounding them is formed by the internal epidermic cells, elongated into cylindrical or club-shaped, simple, or separate hairs.

external longitudinal fissure. At the time of dehiscence the innermost layer of the pericarp separates from the outer layers, and rolls up with the contained seeds into a long cylindrical mass in the ventral angle of the fruit. The seeds concealed in this pulpy body

Akebia quinata.

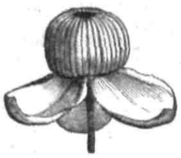

FIG. 42.
Male flower.

FIG. 44.
Female flower.

FIG. 43.
Long. sect. of male flower.

FIG. 41.
Flowering branch.

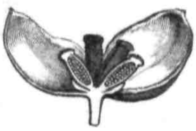

FIG. 45.
Long. sect. of female flower.

contain within their coats[1] an enormous albumen, in whose organic apex is lodged a very small oblique dicotyledonous embryo. Four species[2] of *Akebia* have been described, Lianas from China and Japan. The leaves are alternate digitate, and the flowers form axillary racemes with the females on the lower part.[3]

---

[1] Inside a fleshy envelope is a smooth, glistening, blackish outer coat, and a soft corky inner coat, membranous over the greater part of the seed, much thickened all over the chalazal region. The very small embryo is lodged near the apex of the albumen, at about a quarter-circumference from the hilum. Near this last is a small whitish fleshy aril, besides the general pulpy envelope.

SIEB. & ZUCC., *Fl. Jap.*, t. 77, 78.—A. LAVALLÉE, in *Hort. Franç.*, xix. 103, t. 4.—*Bot. Mag.*, t. 4864.—*Bot. Reg.* (1847), t. 28.—WALP., *Rep.*, i. 98.

[3] The leaves are borne on flexible twigs, which spring from scaly buds every year. The petiole is articulated at the base, and the petiolules at both base and apex. In *A. quinata* the racemes are axillary to the inferior scales of the annual twigs. The female flowers are almost always few in number.

II. ERYTHROSPERMUM SERIES.

Erythrospermum[1] (figs. 46, 47) has regular hermaphrodite flowers. On the convex receptacle is inserted near its base a perianth formed of from seven or eight to twelve or thirteen leaves. Externally are three, usually described as sepals, and internal to these are from four to ten others, broader and more membranous. All are imbricated and petaloid, and it is impossible to distinguish clearly which are to be considered calyx, and which corolla. The number of stamens is

Erythrospermum verticillatum.

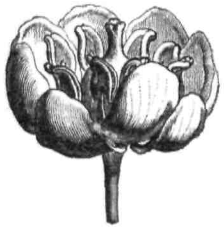

FIG. 46.
Flower ($\frac{3}{1}$).

FIG. 47.
Diagram.

also variable, from five to eight or nine; they each consist of a free filament and a basifixed anther, whose connective, flattened into the shape of a horseshoe, bears on its edges the linear anther-cells; these open longitudinally. The short gynæceum is composed of a one-celled ovary, surmounted by a short style, whose stigmatiferous apex is entire or divided into as many short lobes as there are placentæ. These last are parietal, usually three in number, alternating with the divisions of the style, and bearing an indefinite number of little anatropous ovules. The fruit is thick, and is said to dehisce in three or four valves; it contains several seeds with pulpy envelopes, enclosing an embryo surrounded by copious fleshy albumen. *Erythrospermum* consists of shrubs with alternate or verticillate simple entire exstipulate leaves; the flowers form simple or compound

[1] *Erythrospermum* LAMK., *Ill.*, ii. 407, t. 274.—POIR., *Dict.*, Suppl., ii. 584.—DUP.-TH., *Hist. Vég. Afr. Austr.*, 65, t. 21.—DC., *Prodr.*, i. 257.—ENDL., *Gen.*, n. 5083.—CLOS, in *Ann. Sc. Nat.*, sér. 4, viii. 257.—PAYER, sur les *Fam. Nat.*, 114.—B. H., *Gen.*, 127, 972, n. 16.—H. BN., in *Adansonia*, ix. 311.

terminal racemes, which are sometimes umbellate. Each flower has a pedicel which is articulated at the base, axillary to a bract, and accompanied by two lateral bractlets. Seven or eight species are known, one from Ceylon, the rest from the East Coast of Africa.

The Chilian plant,[1] which has been named *Berberidopsis corallina*, appears to us to form a genus closely allied to *Erythrospermum*. As in that genus, the flowers (fig. 48) possess a convex receptacle and a perianth of from nine to thirteen leaves, imbricated and arranged in threes, all coloured and petaloid, and increasing in size as they are more internal. Above them the perianth is dilated into an irregular annular disk. At this point[2] it bears from seven to ten free stamens with short filaments, and erect elongated introrse two-celled anthers of submarginal longitudinal dehiscence. The ovary is one-celled, with three parietal placentas,[3] bearing each several anatropous ovules; it tapers above into a short style whose apex bears three very short stigmatiferous divisions, alternating with the placentas. The fruit is as yet unknown. *Berberidopsis* is a frutescent, slightly sarmentose plant, with alternate simple leaves, and terminal floral racemes.

Berberidopsis corallina.

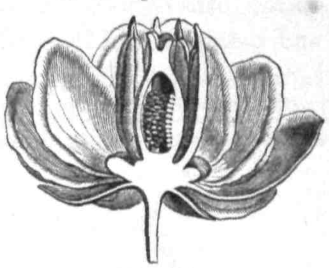

FIG. 48.
Long. sect. of flower ($\frac{3}{1}$).

Erythrospermeæ may, from what has been described above, be considered as *Berberidaceæ*, whose carpels are united edge to edge into a unilocular ovary.[4]

III. BERBERRY SERIES.

The Berberry[5] (Fr., *Vinettier*) has regular hermaphrodite flowers. On the convex receptacle are inserted in due order from below

[1] HOOK. F., in *Bot. Mag.*, t. 5343.—B. H., *Gen.*, 964, n. 7 *a.*—H. BN., in *Adansonia*, ix. 311.

[2] The disk having grown broader on its outer edge when adult, the stamens are inserted on its inner superior edge.

[3] J. HOOKER has seen from two to four ovules on each placenta, while we have counted as many as fourteen on each. They become quite anatropous when adult, with two coats, and those which are near one edge of the placenta look by their raphes to those on the other edge. They are sub-horizontal or ascending.

[4] Hence they occupy in this order the corresponding place to that of *Monodora* in *Anonaceæ*, *Canelleæ* in *Magnoliaceæ*, &c.

[5] *Berberis* T., *Inst.*, 614, t. 385.—L., *Gen.*, n. 442.—ADANS., *Fam. des Pl.*, ii. 433.—J.,

upwards six trimerous verticils, belonging two to the calyx,[1] two to the corolla, and two to the androceum. The sepals are

Berberis vulgaris.

FIG. 49.
Leaf-bearing branch.

FIG. 50.
Flowering branch.

free and petaloid, imbricated in the bud, and caducous. The petals, also imbricated in the bud, are apparently each superposed

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Gen., 286.—GÆRTN., *Fruct.*, i. 200, t. 42.—LAMK., *Dict.*, viii. 615; *Ill.*, t. 253.—DC., *Prodr.*, i. 105.—SPACH, *Suit. à Buffon*, viii. 35.—ENDL., *Gen.*, n. 4814.—B. H., *Gen.*, 43, 964, n. 8.—H. BN., in *Adansonia*, ii. 272, 285, 290.

[1] There is often a third external verticil, and even a fourth, complete or incomplete, to the calyx. The leaves of these whorls are shorter as they are more exterior or inferior, and have often been deemed bracts. They are, however, quite like the sepals.

to a sepal, sessile, concave on the inside and possessing two lateral glands of variable size near their base. There are as many stamens as petals, apparently superposed to them; each consists of a free filament, articulated at its base,[1] and a basifixed muticous two-

Berberis vulgaris.

FIG. 51. Flower ($\frac{3}{1}$).

FIG. 52. Diagram.

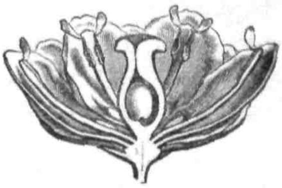

FIG. 53. Long. sect. of flower.

FIG. 54. Stamen dehiscing ($\frac{8}{1}$).

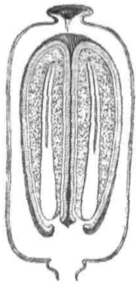

FIG. 56. Long. sect. of fruit ($\frac{3}{1}$).

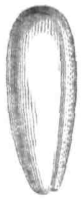

FIG. 57. Seed ($\frac{4}{1}$).

FIG. 55. Bunch of fruit.

celled anther, originally introrse.[2] Each cell opens by a longitudinal slit which is prolonged towards the base and along the whole of the dorsal edge of the outer part of the cell, so that this rises like a valve to free the pollen.[3] The inner half-cell is more or less completely abortive. The gynæceum is superior, free, and unicarpellary,

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[1] The irritability of these stamens is one of the most curious facts in vegetable physiology. See KŒLR., in *Nov. Act. Acad. Sc. Petrop.* (1790).—H. BN., *Des. Mouv. dans les Org. Sex.*, thès., 1856, 30.)

[2] It has often been described as extrorse, but wrongly, in our opinion. (See *Adansonia*, ii. 273.)

[3] The pollen of most of the Berberids in which it has been studied is formed of ellipsoidal grains, with three longitudinal folds. When moistened they become spherical, with three bands. (H. MOHL, in *Ann. Sc. Nat.*, ser. 2, iii. 325.)

formed of a one-celled ovary,[1] surmounted by a subcircular head, which is depressed in the centre and covered with stigmatic papillæ. Near the bottom of the ovary is seen the placenta, which is basilar or somewhat oblique and parietal bearing a variable, usually small, number of ascending anatropous ovules, with the raphe posterior and the micropyles brought down near the base of the cell.[2] The fruit (figs. 55, 56) is a berry containing one or several seeds. These contain within their coats a fleshy albumen surrounding a rather large embryo with its radicles inferior. The Berberries are shrubs with alternate compound, uni- or plurifoliolate leaves. These are persistent and pinnate[3] in the species which have been termed *Mahonia*,[4] while in *Berberis* proper they are caducous, reduced to a single leaflet. There are moreover here two sorts of leaves. On the short twigs ended by the simple racemes we see as a rule only membranous unifoliolate leaves, articulated at the base.[5] But in the longer twigs that do not end in an inflorescence,[6] which develop during the summer, the leaves are usually transformed into, finally, woody spines. These spines have three, five or seven digitate branches, each corresponding to a rib of the leaf. This hence lacks parenchyma, and it is not articulated at the base. The young shoot developed in its axil bears unifoliolate articulate leaves like those we have described above. Between fifty and sixty distinct species of *Berberis* are known,[7] shrubs with yellow wood; they are natives

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[1] This bears externally a longitudinal groove, often very ill marked, corresponding with the placentary side of the gynæceum.

[2] Hence it is anterior and inferior. The ovules have two coats. Those that are highest on the placenta are the oldest. In some species there are only two or three.

[3] The leaflets are opposite, sessile or pedicellate, articulated at the base. Moreover, the rachis is transversely articulated above the insertion of each pair of leaflets. In *M. trifoliata* CHAM., there are on top of the common petiole three digitate leaves, articulated at the base.

[4] NUTT., *Gen.*, i. 211.—DC., *Syst.*, i. 18; *Prodr.*, i. 108.—*Odostemon* RAFIN., in *Amer. Monthl. Mag.* (1819), 192. The flowers usually form compound racemes, and the stamens are marked by the enlargement of the top of the filament near the base of the anther into two lateral hooked prominences, with their points downwards. (See *Adansonia*, i. 337; ii. 275.)

[5] Below this articulation is a short dilated petiole, often bearing above, on either side, a little stipule-like tongue (rudiment of a lateral leaflet ?).

[6] This sometimes occurs reduced to a single flower.

[7] PALL., *Fl. Ross.*, t. 67.—H. B. K., *Nov. Gen. et Spec.*, t. 430–433.—R. & PAV., *Fl. Per.*, t. 280–282.—SIBTH., *Fl. Græc.*, t. 324.—NUTT., *Gen.*, i. 210.—A. S. H., *Fl. Bras. Mer.*, i. 44, t. 10.—SCHRAD., in *Linnæa*, xii. 460.—WALL., *Pl. As. Rar.*, t. 243.—PŒPP. & ENDL., *Nov. Gen. et Spec.*, t. 187.—C. GAY, *Fl. Chil.*, i. 74.—HOOK. F. & THOMS., *Fl. Ind.*, i. 129.—EICHL., in *Mart. Fl. Bras.*, *Berb.*, 230, t. 52.—A. GRAY, *Gen. Ill.*, t. 31.—GREN. & GODR., *Fl. de Fr.*, i. 54.—BOISS., *Fl. Or.*, i. 102.—*Bot. Reg.*, t. 487, 729, 1750.—WALP., *Rep.*, i. 101; ii. 749; iv. 19; *Ann.*, i. 19; ii. 23; iii. 813; iv. 142; vii. 71.

of Europe, Asia, and both the American continents, especially of the western mountainous regions of South America.

Leontice[1] (figs. 58–60) has nearly the flower of *Berberis*, with six or nine petaloid unequal imbricated stamens, and six shorter, thicker, fleshier petals, concave on the inside.[2] The stamens, six in number, are stationed and formed as in *Berberis*. The gynæceum is also

Leontice (Gymnospermium) altaica.

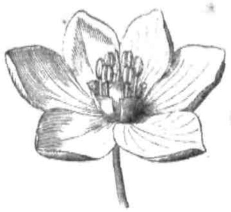

Fig. 58.
Flower ($\frac{2}{1}$).

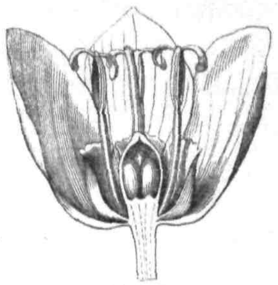

Fig. 59.
Long. sect. of flower ($\frac{3}{1}$).

formed of a one-celled ovary, tapering above into a hollow style, which is stigmatiferous at the apex; but the placenta is nearly basilar and central; it bears from two to four erect anatropous ovules,[3] with their micropyles downwards and outwards. The fruit (fig. 60) is dry and vesicular, indehiscent,[4] or more or less widely open above.[5] In the latter case the seeds become naked, each borne on an erect funicle. Under the seed-coats, which are more or less thick and fleshy, is a fleshy albumen of peculiar form, lodging near its apex the embryo, protected more externally by an inward projection of the seed-coats.[6]

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[1] L., *Gen.*, n. 423.—J., *Gen.*, 287.—Lamk., *Dict.*, iii. 464; *Ill.*, t. 254.—DC., *Prodr.*, i. 109.—Endl., *Gen.*, n. 4810 (part.).—B. H., *Gen.*, 43, 965, n. 10.—H. Bn., in *Adansonia*, ii. 277, 279, 285.—*Leontopetalum* T., *Cor.*, 484.—Lamk., *Ill.*, t. 254, fig. 1.

[2] They have often been described as glands or nectaries.

[3] They have two coats. They are not all of the same age.

[4] This is often observed in *L. Leontopetalum* L., but the parenchyma interposed between the ribs of the pericarp may be absorbed near its apex, leaving very irregular breaches into the fruit.

[5] This is the case in *L. Eversmanni* Bge. and *altaica* Pall., whereof Spach (*Suit. à Buffon*, viii. 66) has hence made the distinct genus *Gymnospermium*. The pericarp, broken open above early, even before maturity, leaves the seeds naked, and forms a sort of long frill around the bases of their funicles.

[6] We have shown (in *Adansonia*, ii. 278) that outside the embryo are found five distinct layers in the seed of *L. Leontopetalum*. The internal seed-coat is thickened into a sort of rim around the endostome, a phenomenon which we have compared with the development of an internal arillode. This internal prominence of the endostome later on, crowns the radicle of the embryo.

L. Chrysogonum[1] has been distinguished generically from the other species under the name of *Bongardia*,[2] because its petals are smaller and more like sepals than in *Leontice* proper; while it may have from four to eight ovules. We only make this a section apart; we follow the same course with *L. thalictroides*,[3] which was also formerly elevated to generic rank,[4] because while its petals are thin, as in *Bongardia*, its pericarp is early destroyed above, only forming a very short sheath around the base of the funicles of the seeds; and the seed-coats are more fleshy in texture. Thus formed of four sections,[5] *Leontice* includes four or five perennial herbaceous species,[6] with a tuberous rhizome; they are nearly all natives of Central or Eastern Asia. One or two species of *Leontice* proper are found in the east of Mediterranean Europe, and *L. thalictroides* inhabits North America. From the rhizome spring alternate leaves, pinnatisect, or pinnately bi- or tri-sect. The flowers[7] form ramified racemes on a scape which is naked or bears a few leaves or bracts.

Leontice Leontopetalum.

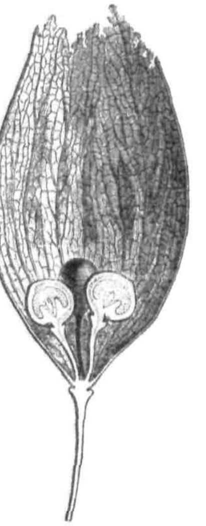

FIG. 60.
Long. sect. of fruit.

Epimedium[8] (figs. 61–69) bears hermaphrodite regular flowers formed of dimerous whorls. The calyx presents first two outer sepals, next an inner alternating pair, within these a third superposed to the first, and so on; there may be from eight to ten of

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[1] *Spec.*, 447.—DC., *Prodr.*, n. 1.—*Chrysogonum Dioscoridis* RAUW., *It.*, 119.—*Bongardia Chrysogonum* SPACH, *Suit. à Buffon*, viii. 65.—*P. Rauwolfii* LED., *Fl. Ross.*, i. 80.—*B. Olivieri* C. A. MEY., *Verz. Pfl. Cauc.*, 174.

[2] C. A. MEY., *loc. cit.*—ENDL., *Gen.*, n. 4809.—JAUB. & SPACH, *Ill. Pl. Or.*, t. 396.—B. H., *Gen.*, 43, n. 9.—*Chrysogonum* BAUH., *Hist.*, iii. 876, fig. 2.

[3] L., *Spec.*, 448.—DC., *Prodr.*, n. 5.

[4] *Caulophyllum* MICHX., *Fl. Bor.-Amer.*, i. 204, t. 21.—B. H., *Gen.*, 43, n. 11.—A. GRAY, *Gen. Ill.*, t. 32.

[5] *Leontice.* Sect. 4.
1. *Leontopetalum* DC.
2. *Bongardia* (C. A. MEY.).
3. *Gymnospermium* (SPACH).
4. *Caulophyllum* (MICHX.).

[6] R. BR., in *Trans. Linn. Soc.*, 143, t. 7 (*Caulophyllum*).—DCNE., in *Ann. Sc. Nat.*, sér. 2, ii. t. 12 (*Caulophyllum*).—NUTT., *Gen.*, i. 210 (*Caulophyllum*).—JAUB. & SPACH, *Ill. Pl. Or.*, iv. t. 396 (*Bongardia*).—BOISS., *Fl. Or.*, i. 99.—*Bot. Mag.*, t. 3245.—WALP., *Rep.*, i. 100 (*Bongardia*); *Ann.*, i. 19; iv. 149.

[7] All are yellow.

[8] T., *Inst.*, 232, t. 117.—L., *Gen.*, n. 148.—ADANS., *Fam. des Pl.*, ii. 432.—J., *Gen.*, 287.—LAMK., *Dict.*, ii. 376; Suppl. ii. 570; *Ill.*, t. 83.—DC., *Prodr.*, i. 110.—SPACH, *Suit. à Buffon*, viii. 55.—PAYER, *Organog.*, 240, t. 52.—ENDL., *Gen.*, n. 4811.—B. H., *Gen.*, 44, n. 14.—H. BN., in *Adansonia*, ii. 269, 271, 275.

these leaves. The four innermost are more petaloid and better developed than the rest. The corolla is double, consisting of two outer petals, and two alternating inner petals. Each petal bears a little above its base, either a nectariferous pit or, more frequently, a long spur.[1] All these pieces are imbricate-decussate in præfloration.

Epimedium (Macroceras) violaceum.

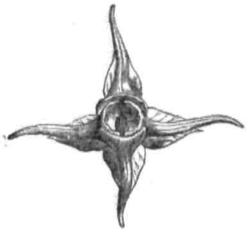

FIG. 61.
Flower.

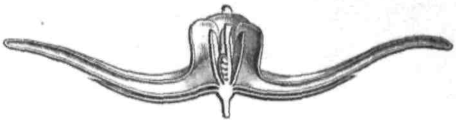

FIG. 62.
Long. sect. of flower ($\frac{2}{1}$).

The androceum consists of four stamens, one in front of each petal, they are formed of a free filament and a basifixed introrse two-celled anther. The outer half-cell alone rises into a long flap, as in *Berberis*. The gynæceum though like that of *Berberis*, differs in the more elongated ovary and style; the end of the latter is stigmatiferous. The ovary contains in its single cell a long parietal placenta bearing two vertical rows of more or less ascending anatropous ovules,[2] with their micropyles downwards and outwards. The fruit is dry, capsular, and many seeded; it opens by a vertical elliptical cleft, which separates from the placentary part, a valve whose edges were before indicated by a continuous groove.[3] The seeds, which possess an entire or laciniate

Epimedium (Microceras) alpinum.

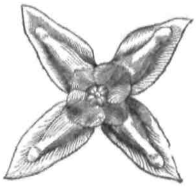

FIG. 63.
Flower ($\frac{3}{1}$).

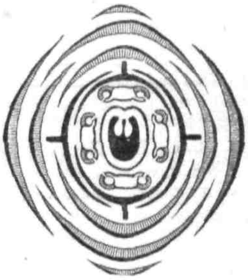

FIG. 64.
Diagram.

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[1] On the length of this depends the division of the genus into the sections *Macroceras* and *Microceras*, established by MORREN & DECAISNE (in *Ann. Sc. Nat.*, sér. ii. 352). We have added a section *Dimorphophyllum*, whereof *E. pinnatum* FISCH. is the type. (See *Adansonia*, ii. 270.)

[2] They have two coats; the younger are inferior. Above the hilus is already seen a rudimentary aril.

[3] It has been supposed, though wrongly, that this flap represented a sterile carpellary leaf, placed facing the ovuliferous one. The gynæceum of *Epimedium* at no age consists of more than one carpellary leaf, and organogeny demonstrates this (see *Adansonia*, ii. 276.). We think that the line of dehiscence of this flap corresponds to the more horizontal cleft of dehiscence of the carpel of *Jeffersonia*.

fleshy aril,[1] contain within their coats a fleshy albumen whose axis is occupied by an often bowed embryo, with its radicle inferior.

In the flowers of *E. diphyllum*[2] the petals have neither spur nor nectariferous pit at the base; it is on this character,[3] of seemingly inconsiderable value that the genus *Aceranthus*[4] has been founded; this should in our opinion be restored as a section to the genus *Epimedium*.

Epimedium (*Dimorphyllum*) *pinnatum*.

FIG. 65.
Flower (2/1).

E. hexandrum[5] is a North American species, exceptional in the trimerous verticils of its flowers. As all the other characters are generally speaking those of *Epimedium* it can only be made a distinct section thereof; it has been named *Vancouveria*.[6]

Thus constituted,[7] this genus contains half a score of species, herbaceous perennials with a subterraneous creeping rhizome. The leaves are alternate, pinnately compound, rarely bifoliolate, more frequently bi- or tri-sect. The flowers form terminal or leaf-opposed,

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[1] This aril seems to us to be formed by a mere fold of the seminal epidermis. (See *Adansonia*, ii. 287.)

[2] LODD., *Bot. Cab.*, t. 1358.

[3] Not to mention that of the leaves, which can have no generic value. The flowers of the other

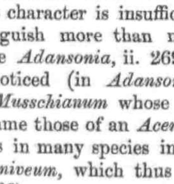

FIG. 66.

species of *Epimedium* differ in their spurred petals, but this character is insufficient in *Aquilegia* to distinguish more than mere forms or varieties. (See *Adansonia*, ii. 269.) L. MARCHAND has noticed (in *Adansonia*, iv. 127) flowers of *E. Musschianum* whose petals lacked spurs, and became those of an *Aceranthus*. This anomaly occurs in many species in our gardens, especially *E. niveum*, which thus become aceranthous (fig. 66).

[4] MORR. & DCNE., in *Ann. Sc. Nat.*, sér. 2, ii. 349, t. 14.—ENDL., *Gen.*, n. 4813.—B. H., *Gen.*, 44, n. 12.—*Bot. Mag.*, t. 3448.—WALP., *Rep.*, i. 101.

[5] HOOK., *Fl. Bor.-Amer.*, i. 30, t. 13.

[6] MORR. & DCNE., in *Ann. Sc. Nat.*, sér. 2, ii. 351.—ENDL., *Gen.*, n. 4812.—B. H., *Gen.*, 44, n. 13.—WALP., *Rep.*, i. 101. In cultivation we occasionally find *Epimedium* flowers with five petals (fig. 67), which serve as a passage between

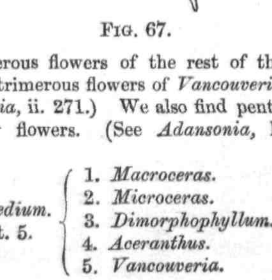

FIG. 67.

the dimerous flowers of the rest of the genus and the trimerous flowers of *Vancouveria*. (See *Adansonia*, ii. 271.) We also find pentamerous Berberry flowers. (See *Adansonia*, loc. cit., 272.)

[7] *Epimedium*. Sect. 5.
1. *Macroceras*.
2. *Microceras*.
3. *Dimorphophyllum*.
4. *Aceranthus*.
5. *Vancouveria*.

simple or compound, racemes. The plants are natives of the temperate regions of Asia, Europe, and the North of Africa.[1]

In *Nandina*,[2] which has sometimes been made the type of a small distinct group, the floral verticils are trimerous and numerous, formed of leaves arranged in six radiating rows. They are imbricated and become larger and more membranous and coloured as they are inserted higher up on the receptacle. Above these are six stamens, each superposed to a perianth leaf, and formed of a short filament and a basifixed anther, whose two lateral subintrorse cells dehisce each by a longitudinal cleft. The gynæceum is nearly that of a *Berberis*, with an ovary whose parietal placenta usually bears only two[3] nearly collateral obliquely ascending ovules, whose micropyles look downwards and outwards. The style forms a slender hollow cornet, whose mouth is incised into fringed stigmatiferous lobes. The fruit is a berry, containing one or two seeds formed like those of *Leontice*. *N. domestica*, the only species[4] of this genus is a Chinese and Japanese shrub, with erect stems and alternate bi- or tripinnatisect leaves. Its flowers form terminal or leaf-opposed ramified racemes of cymes.

Epimedium (Aceranthus) diphyllum.

FIG. 69. Flower ($\frac{2}{1}$).

FIG. 68. Habit.

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[1] SIBTH., *Fl. Græc.*, t. 130.—REICHB., *Ic. Fl. Germ.*, iii. t. 18.—JACQUEM., *Voy.*, *Bot.*, t. 8.—MORR. & DCNE., in *Ann. Sc. Nat.*, sér. 2, ii. 347, t. 12, 13.—GREN. & GODR., *Fl. de Fr.*, i. 55.—BOISS., *Fl. Or.*, i. 101.—COSS., in *Bull. Soc. Bot. de Fr.*, ix. 167.—*Bot. Reg.*, t. 1906; (1840), 43.—*Bot. Mag.*, t. 3745, 3751, 4456.—WALP., *Rep.*, i. 100; v. 18; *Ann.*, i. 19; ii. 23; vii. 74.

[2] THUNB., *Diss. Nov. Gen.*, i. 14; *Fl. Jap.*, 9.—J., *Gen.*, 329.—GÆRTN., *Fruct.*, ii. 69, t. 92.—POIR., *Dict.*, Suppl., iv. 57.—LAMK., *Ill.*, t. 261.—BANKS, *Ic. Kæmpf.*, t. 13, 14.—DC., *Prodr.*, i. 109.—MORR. & DCNE., in *Ann. Sc. Nat.*, sér. 2, ii. t. 12, fig. *d.*—SPACH, *Suit. à Buffon*, viii. 26.—B. H., *Gen.*, 44, n. 12.—H. BN., in *Adansonia*, ii. 285.

[3] Sometimes three or four are found in two vertical rows.

[4] THUNB., *loc. cit.*—*Herb. Amat.*, t. 281.—*Bot. Mag.*, t. 1118.—*Nandin* KÆMPF., *Amœn. Exot.*, 776. There are several cultivated varieties of this species.

IV. PODOPHYLLUM SERIES.

The genus *Podophyllum*[1] (figs. 70, 71) has been placed by various authors in very different orders, and is in fact as closely allied to *Berberidaceæ* as to *Ranunculaceæ*, and perhaps to *Papaveraceæ* through *Sanguinaria* and *Jeffersonia*. Several authors have attempted to cut the knot by making a distinct group *Podophyllaceæ*. In any case, even if it be made an abnormal series of *Berberidaceæ*, it has regular

Podophyllum peltatum (*May Apple*).

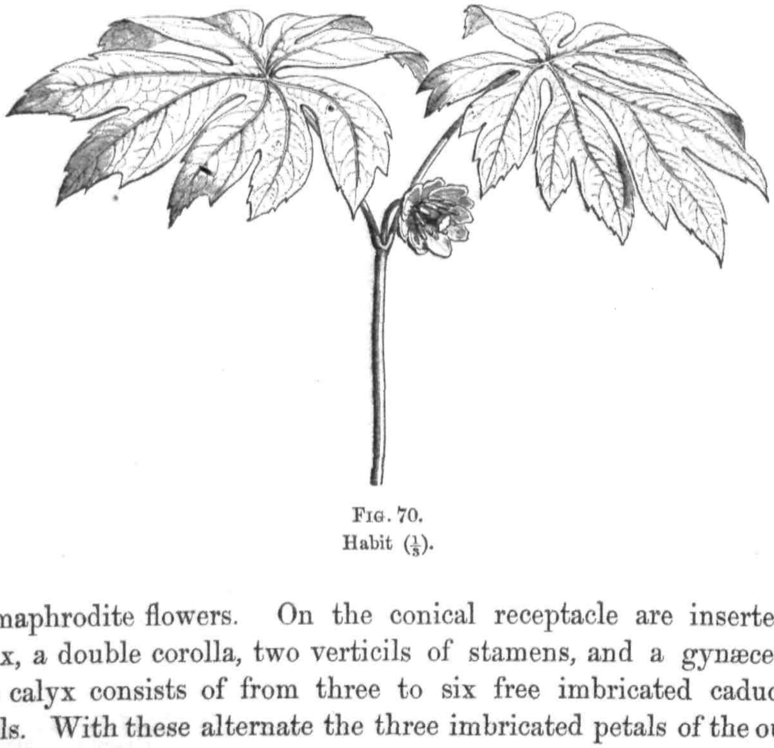

FIG. 70.
Habit ($\frac{1}{3}$).

hermaphrodite flowers. On the conical receptacle are inserted a calyx, a double corolla, two verticils of stamens, and a gynæceum. The calyx consists of from three to six free imbricated caducous petals. With these alternate the three imbricated petals of the outer corolla. The inner corolla consists of from four to six petals. If six be the number, each of the petals is replaced by a pair of leaves;

[1] L., *Gen.*, n. 646.—ADANS., *Fam. des Pl.*, ii. 432.—J., *Gen.*, 235.—LAMK., *Dict.*, v. 445; *Ill.*, t. 449.—DC., *Syst.*, ii. 33; *Prodr.*, i. 111.—SPACH, *Suit. à Buffon*, viii. 70.—ENDL., *Gen.*, n. 4806.—B. H., *Gen.*, 45, 965, n. 18.—H. BN., in *Adansonia*, ii. 275, 282, 284, 289.—*Anapodophyllum* T., *Inst.*, 239, t. 122.

when there are four or five, it is due to the deduplication of only one or two of these leaves. The stamens of the outer whorl, alternating with the sepals, are also three in number; while the inner whorl behaves like that of the corolla, and is similarly composed of a variable number of elements. Each anther consists of a free hypogynous filament, surmounted by a basifixed two-celled anther, which dehisces by two marginal clefts. The gynæceum is unicarpellary; its ovary is surmounted by a short style whose apex expands into a stigmatiferous head, formed of a blade repeatedly folded on itself. In the single cell of the ovary is seen a longitudinal parietal placenta, whereon are inserted a large number of nearly vertical rows of horizontal or ascending anatropous ovules whose micropyles look outwards. The fruit is an indehiscent many-seeded berry. The seeds, more or less imbedded in the pulpy tissue of the placenta, enclose in their coats an embryo surrounded by copious fleshy albumen. *Podophyllum* comprises two species of perennial herbs, one from temperate India,[1] the other from North America.[2] The stem is a subterranean rhizome from which arise alternate peltate digitiveined and digitilobate leaves. The flowers are solitary on a sort of scape, which bears on its lower part one or two leaves.

Podophyllum peltatum.

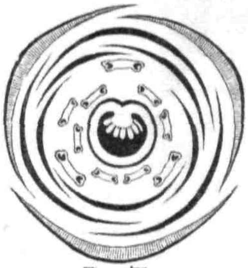

FIG. 71. Diagram.

The flowers of *Jeffersonia*[3] (figs. 72, 73) are formed like those of *Podophyllum*, except that their anthers open by two valves, corresponding to half-cells,[4] as in *Berberis*. Moreover, the fruit is dry and capsular; it is urn-shaped with a groove on the side of the pla-

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[1] *P. Emodi* WALL., *Cat.*, n. 814.—HOOK. F. & THOMS., *Fl. Ind.*, i. 232. — *P. hexandrum* ROYL., *Ill.*, 64.— DCNE., in *Jacquem. Voy.*, *Bot.*, ii. t. 9.—WALP., *Ann.*, iv. 149.

[2] *P. peltatum* L., *Spec.*, 722.—MICHX., *Fl. Bor.-Am.*, i. 309.—NUTT., *Gen.*, 265.—A. GRAY, *Gen. Ill.*, t. 35, 36.—WALP., *Rep.*, i. 100; *Ann.*, ii. 22; vii. 75.—? *P. callicarpum* RAFIN., *Fl. Ludov.*, 14.

[3] BART., in *Act. Soc. Amer.*, iii. 334, ic.—DC., *Prodr.*, i. 111.—ENDL., *Gen.*, n. 4807.—B. H., *Gen.*, 44, n. 17.—H. BN., in *Adansonia*, ii. 276, 280, 285, 287, 291.—*Plagiorhegma* MAXIM., *Prim. Fl. Amur.*, 34, t. 1.

[4] Here the anthers are extrorse, for the cells are directed obliquely, as seen in transverse section, and the connective has its broader free surface on the inside. But it is always the outer half-cell which rises on each side into a flap, while the inner is less developed, and remains adherent to the connective.

centa. The upper part of the carpellary leaf separates from the lower by a transverse cleft, and represents the cover of the urn, while the short style, crowned by a folded stigmatiferous head, does very well for the knob. The ovules are numerous and arranged as *Podophyllum*, with their raphes superior.[1] When the lid of the capsule rises at maturity the seeds are freed; they have a fleshy basilar aril[2] and contain a little embryo near the apex of the copious albumen. *Jeffersonia* consists of perennial herbs whose rhizome vegetates like that of *Podophyllum*. The leaves are alternate petiolate digitiveined, usually bilobate or bipartite.[3] The flowers are solitary, each borne on a naked peduncle. Of this genus also two species are known, one American[4] the other from Northern Asia.

Jeffersonia diphylla.

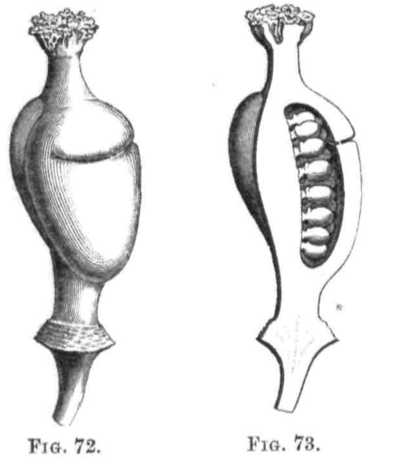

FIG. 72. Gynæceum (4/1). FIG. 73. Long. sect. of gynæceum.

The flowers of *Diphylleia*[5] also resemble those of *Podophyllum*, possessing a perianth of from nine to twelve leaves, whereof the inner are larger and more petaloid. The stamens, six in number, open by valves as in *Epimedium*. The ovary contains some four ascending ovules[6] on a parietal placenta. The fruit is a few-seeded berry. The only known species of this genus is *D. cymosa*, found in North America and Japan. Its vegetative characters are those of *Podophyllum*, but its flowers are numerous, grouped into an umbelliform cyme on top of a terminal peduncle.

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1 They have two coats, and those of the outer series are the younger, as are the lower ones in each row.

2 Formed of cells springing from above the hilum, and elongated into hairs. (See *Adansonia*, ii. 287.)

3 They are really trifoliolate, but the development of the terminal lobe is early stopped, so that it is represented by a very little tongue. (See *Adansonia*, ii. 291.)

4 *J. diphylla* PERS., *Syn.*, i. 418.—MICHX., *Fl. Bor.-Amer.*, i. 236.—NUTT., *Gen.*, i. 253.—SIMS, in *Bot. Mag.*, t. 1513.—WALP., *Rep.*, i. 100; *Ann.*, ii. 23; vii. 75.

5 L. C. RICH., in *Michx. Fl. Bor.-Amer.*, i. 903, t. 19, 20.—DC., *Prodr.*, i. 110.—NUTT., *Gen.*, i. 209.—ENDL., *Gen.*, n. 4808.—A. GRAY, *Gen. Ill.*, t. 33.—B. H., *Gen.*, 44, n. 16.

6 When four in number they are arranged in two vertical rows, with their micropyles inferior; often there are only two or three.

Finally, *Achlys*[1] represents a reduced type of this group, wherein the perianth has disappeared.[2] The flower bears from six to eight free stamens[3] with two-celled anthers; the walls of two of the half-cells[4] rise up into valves. The ovary, formed as in other *Berberidaceæ*, is surmounted by a short style which swells into a large stigmatiferous head; it contains a single ascending anatropous ovule, nearly basilar. The fruit is dry one-seeded and dehiscent. *Achlys* consists of two species of perennial herbs, one from the west of North America,[5] the other from Eastern Asia.[6] Their rhizome and bi- or tripartite palmiveined leaves are as in *Jeffersonia;* the flowers are collected into a terminal *pedunculate* spike.

The order *Berberidaceæ* thus includes at present sixteen genera. It was founded in 1789 by A. J. DE JUSSIEU,[7] under the name of *Ordre de Vinettiers* (Berberides). With *Berberis, Leontice*, and *Epimedium* he placed a large number of genera,[8] which he knew imperfectly, belonging to very different groups; he classed in *Podophyllum Ranunculaceæ*,[9] and THUNBERG's genus *Nandina* among the *genera incertæ sedis.*[10] *Lardizabala* of RUIZ & PAVON, known as early as 1797, was made by DE CANDOLLE,[11] in 1818, the type of a tribe of the order *Menispermaceæ;* DECAISNE thought right to make it a distinct order in 1837,[12] putting with it *Akebia, Parvatia, Stauntonia*, and WALLICH's genus *Holbœllia.*[13] *Diphylleia*[14] dates from 1803; DE CANDOLLE placed among *Podophyllaceæ*[15] BARTON's genus *Jeffersonia* of the same date, and *Achlys* which he himself founded in 1818. To *Berberidaceæ* BENTHAM & J. HOOKER[16] united *Lardizabaleæ* as a tribe thereof, to which J. HOOKER & THOMSON had added *Decaisnea*

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[1] DC., *Syst.*, ii. 35; *Prodr.*, i. 112.—ENDL., *Gen.*, n. 4805.—B. H., *Gen.*, 45, n. 19.

[2] Around the base of the sexual organs the axis only bears a small projecting rim.

[3] The filaments are long-tapering towards the base.

[4] The two nearest the medium line of the anther.

[5] *A. triphylla* DC., *Syst.*, ii. 35.—HOOK., *Fl. Bor.-Am.*, i. 30, t. 12.—*Leontice triphylla* SM., in *Rees Cycl.*, n. 5.

[6] *A. japonica* MAXIM.

[7] *Gen.*, 286, Ord. 18.

[8] For instance, several Violariads, *Hamamelis*, an Anacardiad, *Corynocarpus*, &c.

[9] *Op. cit.*, 235.

[10] *Op. cit.*, 429.

[11] *Syst.*, i. 509; *Prodr.*, i. 95.

[12] *Mém. sur la Fam. des Lardizabalées . . . prés. à l'Acad. des Sc. Séance du* 4 *Sept.*, 1837 (in *Arch. Mus.*, i. 143–213, t. 10–13).

[13] *Tent. Fl. Nepal.* (1802–1803).

[14] L. C. RICH., in *Michx. Fl. Bor.-Am.*, i. (1803) 203.

[15] *Syst.*, ii. 31; *Prodr.*, i. 111.

[16] *Gen.*, i. 33, 40 (1862).

in 1855.[1] J. HOOKER in 1867[2] discovered the new syncarpous genus which he named *Berberidopsis*, to which we have added[3] in the same series the genus *Erythrospermum* of LAMARCK,[4] a type hitherto referred to *Bixaceæ*.

There are nearly a hundred species known, divided almost equally between the two hemispheres.[5] Hitherto the genera *Lardizabala*, *Berberidopsis*, and *Diphylleia*, with the section *Vancouveria* of *Epimedium*, have only been observed in America. *Nandina* is confined to China and Japan, and *Erythrospermum* to the eastern islands of Africa and Ceylon, omitting *Lardizabala*. All the other five genera of *Lardizabaleæ*, comprising half a score species, are from temperate Eastern Central Asia. *Achlys*, *Jeffersonia*, and *Podophyllum* have each one species in Asia, and one in North America. By far the larger part of *Berberis* is American; but this is the case with only one of the four species of *Leontice*, the others being Asiatic and European. Europe possesses, moreover, representatives of *Epimedium* and *Berberis*. *B. vulgaris* extends to 60° N. in the north of Scandinavia, and this is about the limit of the Chinese and Japanese *Berberidaceæ*, *Epimedium*, *Jeffersonia*, *Achlys*, and *Nandina*. An *Epimedium* is also found in temperate Europe. In North Africa we find a *Berberis*, an *Epimedium*, and perhaps a *Leontice*. But no member of the Order has been found in continental South Africa or Australasia. In South America *Berberidopsis* and *Berberis* extend to 50° S. in Valdivia and Patagonia. Only one species from Brazil has been described, *Berberis laurina*.

As at present constituted this Order is one *par enchaînement*. Accordingly it presents hardly one absolute character. No doubt the placentation is almost constantly parietal or basilar, and the ovary one-celled; but the carpels are sometimes free, sometimes united edge to edge, with several placentæ in the cell. The seeds are always albuminous, but the form and consistency of the albumen and its relations (in position and size) to the embryo are most variable. The other characters are either nearly constant

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[1] *Fl. Ind.*, i. 212.
[2] *Bot. Mag.*, t. 5343.
[3] *Sur les Affinités des* Erythrospermum (in *Adansonia*, ix. (1870) 311).
[4] *Ill.*, ii. (1793), 407.
[5] In the proportion of 52 to 45.

or variable. Among the former characters we may note that the leaves are alternate, but verticillate in one *Erythrospermum;* they lack stipules, which however cannot be overlooked in several *Lardizabalas;* they are compound or deeply lobed, but simple in *Erythrospermum, Berberidopsis,* and certain species of *Berberis;* the perianth is usually multiple (with calyx and corolla both double); but in *Akebia* it may be reduced to a single whorl, and in *Achlys* it is quite absent; the type of the flower is ternary, but binary in most species of *Epimedium;* the staminal filaments are free, but united into a tube in about half the *Lardizabaleæ;* the anthers mostly open by valves, but are rimose in *Lardizabaleæ, Nandina, Podophyllum,* and *Erythrospermeæ;* the ovary is pluriovulate, but contains only one ovule in *Achlys.* The characters that vary from one genus to another are the habit and consistency of the stems, the pinnate or digitate nervation of the leaves, the inflorescence, the consistency and dehiscence of the pericarp, the presence of an aril, and its mode of formation when present.

In histological character *Berberidaceæ* present two distinct types of organization, which one would hardly expect to find in the same natural group, if one did not know that affinities of floral organization do not carry with them identity of anatomical detail. The first type is that of the Berberries and other woody plants of the same group, whose organization may be easily studied in most of the garden species of *Berberis* and *Mahonia,* as we have recently done.[1] "The twigs of *Berberis* appear glabrous; they are, however, covered with conical or subconical hairs;[2] which long persist, and then turning brown with the epidermic cells, finally come off with them, leaving the bark only protected by a sort of periderm found within the superficial parenchymatous layers. Internal to this is a yellowish green cellular layer, whose elements usually end by parting company. They are cells, which then leave irregular lacunæ between one another. On the walls of these spaces may be seen projecting either isolated cells or strings of unequal more or less rounded cells. With age the contents of these cells may disappear; but then in several species the wall remains coloured a bright yellow, and appears to be saturated with the same pigment as is found in the liber fibres. In a transverse section of a young branch we see a small circle of fibrovascular bundles separated from

[1] In *Adansonia,* ix. 320. [2] Especially in *B. vulgaris.*

one another by medullary rays. In each bundle the liber is represented in section by a crescent, outside of which is another corresponding to part of the generative zone. More internally is the woody part of the bundle forming a triangle with its acute apex inwards. The relative distribution of the vessels and fibres is singular: the former, on the whole rather irregularly arranged, are so placed as to be surrounded by fibres on every side, especially on the inside." Besides the scattered vessels there is a central linear series in each bundle. The tracheæ are very scanty in the medullary sheath. But towards this side of the bundle the woody fibres become very numerous, dotted and perforated, and they are internal to the parts that usually constitute the medullary sheath.[1] In the medullary rays is green matter, which also exists at first in the peripheral cells of the pith. "Outside, the medullary rays are continuous, without any line of demarcation between the wood and the bark, passing between the liber bundles. It is in the substance of the short unequally fusiform fibres that constitute these bundles that we find the bitter yellow limpid colouring matter whose presence characterizes all the species of *Berberis*.[2]"

The second type is that of the *Podophylleæ*, whereof R. Brown noticed[3] that *Podophyllum*, like *Diphylleia*, has in its stem irregularly scattered fibrovascular bundles; so that in this respect their structure approaches far more nearly that of a Monocotyledon.[4] In transverse section we find in the common cellular matrix spots representing the sections of as many isolated fibrovascular bundles, which are more slender as they are more external, and are only absent in the centre.

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[1] These fibres cannot be regarded as other than woody fibres, for though they present several differences in length and thickness, we find every possible transition. The tracheæ are very few in number, lying among the most internal vessels of each layer.

[2] The sarmentose stems of the *Lardizabaleæ* are formed on the same general plan. They are remarkable for the clearness of the medullary rays, for the form and freedom of the liber bundles, and for the tardy multiplication of the fibrovascular bundles, which recalls what occurs in *Menispermaceæ*. In *Stauntonia* Lindley mentions the curvature of the medullary rays (*Intr. to Bot.*, i. 213). Is this normal? In pretty old stems of *Akebia quinata* we saw these rays straight. We also notice the thickness and softness of the liber bundles as compared with the woody consistency of the interposed parts of the medullary rays.

[3] *Congo*, 442, not.; *Misc. Works*, ed. Benn., i. 124, note i.

[4] J. G. Agardh (*Theor.*, 75) says he has found that the stems of *Podophyllum* and *Diphylleia* are organized completely, as in Monocotyledons. "... fasciculos nempe vasorum omnes *medullares* et sparsos, singulos vero strato prosenchymatoso ambiente, vasisque cambialibus extrorsum, et spiralibus introrsum dispositis, constitutos. *Diphylleia* strato corticis aliquantulum magis evoluto tantum a *Podophyllo* distat. Monocotyledonea hac caulis structura *Podophylleæ* ad *Nymphæaceas* tendere forsan videntur."

Each bundle has a layer of cortical fibres, a cambial zone, and woody fibres, and vessels, among which are several tracheæ. In *Podophyllum* is another anatomical character which completes its resemblance with certain *Liliaceæ*, *Asparagaceæ*, and *Smilaceæ*; inside the epidermis and the first zone of cortical parenchyma is a sheath of tough thick-walled elements. This zone is wanting in *Leontice*, which are hence even the more close to Monocotyledons generally. Here the fibro-vascular bundles are scattered through the axis, as in *Podophyllum*,[1] and each consists of a cortical and a woody portion. In the centre where they are absent the cellular tissue may be rarified and even leave a fistular cavity.

Affinities.—All botanists are agreed that *Berberidaceæ* come as close as possible to *Menispermaceæ*, and that they differ on the whole from these in the hermaphrodism of their flowers, the small size of their embryo, and the absence of an intruded prominence of the endocarp. These differentiating characters are by no means constant. In *Lardizabalaceæ* the flowers are not hermaphrodite, and in this respect the series is nearer to the *Menispermaceæ*, wherein it was formerly classed. True, it is compound-leaved, like many *Berberideæ*; but this character again we know is possessed by the Menispermaceous genus *Burasaia*. To distinguish *Lardizabaleæ* one might turn to the placentation; yet in this *Decaisnea* is exceptional, for its placenta is on the ventral angle as in *Berberideæ* or *Podophylleæ*. The character of the embryo is a better one, no doubt; but the intruded process of the stone is not constant in Menispermads. A better differential character, if one is to be sought in the pericarp, is that this is drupaceous in *Menispermaceæ*, while it is either dry or fleshy right through in *Berberidaceæ*. It is very difficult to make any perfectly sharp distinction of *Berberidaceæ* from the other surrounding apocarpous orders. We need only recall how *Podophyllum* has been placed among *Ranunculaceæ*, while *Glaucidium*, placed in this last order, has, when its gynæceum is unicarpellary, quite the flower of the *Podophylleæ*. The ternary type of the flower in this series cannot

[1] In the parenchyma of the stem of *Podophyllum* must be mentioned the presence of numerous vertical rows of cylindroidal cells, each cell containing a large subspherical crystal, pretty regularly muricated.

be cited as a distinctive feature, for the same is found in several species of the genus *Ranunculus* itself. But we may truly say that the stamens of *Podophylleæ* are arranged in ternary verticils, whose symmetry is recognisable even when the elements of some of these whorls are deduplicated. Thus the androceum of this series comes far nearer that of *Berberis* (or, with a change to a binary type, *Epimedium*), than that of *Magnoliaceæ* or *Anonaceæ*, whose stamens are so often indefinite and spirally arranged. And in the few Anonads that have only three, six, or nine stamens, the albumen is ruminated, which it never is in *Berberidaceæ*. Again, the stamens often dehisce by valves in this order; and this fact, though not constant, is never found in any of the orders we have just named. It occurs, however, in *Lauraceæ* generally, and here we must turn for the remaining close affinity of the *Berberidaceæ*, especially when they possess only a pauci- or uniovulate carpel, trimerous flowers, and a fleshy fruit. By their compound leaves *Lardizabaleæ* are like *Illigereæ*, while by their pluricarpellary gynæceum they recall the *Monimiaceæ*, which are equivalent to pluricarpellary Laurads. We know, however, that the mode of formation of the valves is quite different in *Berberidaceæ* and in *Lauraceæ*, and that the embryo of the latter order is large and exalbuminous. Accordingly we may place the order *Berberidaceæ* between *Lauraceæ*, *Ranunculaceæ*, *Schizandreæ*, and *Menispermaceæ*; not omitting to note at the same time its affinities with orders possessing a unilocular ovary with several parietal placentas, to which it is linked by *Berberidopsis*, and especially *Papaveraceæ* and perhaps *Bixaceæ*; *Sanguinaria* in the former order comes very close to *Jeffersonia*; and placed among the latter we have found in *Erythrospermum* a type whose floral organization is identical with that of *Berberidopsis*.

Berberine is the principle which gives the chief properties to most *Berberidaceæ*. This is a yellow substance, of alkaline reaction, crystallizing in fine needles.[1] Associated with it is found in the roots of the Berberries a white friable acrid bitter crystallizable

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[1] GUIB., *Drog. Simpl.*, ed. 6, iii. 726.—FLEITMANN (in *Ann. d. Chim. und Pharm.*, lix. 160) made known its alkaline properties.

matter, called *oxyacanthine*. It is no doubt to the presence of these principles that the common Berberry[1] (Fr., *Épine-Vinette*) owes all the virtues ascribed to it of old, which it shared with some other species, especially the *Lycium* of DIOSCORIDES. It served to arrest "all kinds of flux," and to cure wounds; it was even considered an abortive. Its bitterness and stringency made it a tonic stomachic and febrifuge. Its seeds, astringent and somewhat vinous in taste, entered into the *diascordium*. The *ruzot* plant, now recognised as a *Berberis*, *B. Lycium*,[2] is also used as an astringent in the East, and no doubt as being such is successfully prescribed in all cases of ophthalmia. *Ruzot* is used as a tonic, either alone or combined with alum and opium. *Huziz* is a sort of extract prepared from a *Berberis*, which ROYLE has shown to be the *Lycium* of DIOSCORIDES. The Arab and Persian physicians have established "that the best kind came from Nuggur-Kote, in the neighbourhood of Lahore." According to the "information obtained from a Hindoo physician of repute, *ruzot* is the inspissated extract made from a decoction of the fresh wood of *Dar-Kuld*." This Sanscrit or Hindoo word signifies "*turmeric* coloured wood." They add, in defining the word, that it refers to an Indian tree with yellow wood from which *ruzot* is made. Moreover, the druggists of the Indian bazaars assured ROYLE that *Dar-Kuld* and *ruzot* are still imported in great quantities from Nuggur-Kote. Continuing his researches on this matter, ROYLE found on his journey to the Himalayas the tree called *Dar-Kuld*, and assured himself that it was a Berberis. He found, too, that the extract or *ruzot* was obtained from *B. aristata*, *B. asiatica*, *B. Lycium*, and *B. pinnata* (*Mahonia nepalensis* DC.), indifferently. In fact, the wood of these plants cut into small pieces is identical with *Dar-Kuld*, and the obtained extract with *ruzot*. ROYLE adds some interesting particulars concerning these plants. "*B. Lycium* is found as low as 3000 feet; *B. asiatica* grows naturally in 30° of latitude, at elevations of from 5000 to 7000 feet; *B. aristata*

[1] *B. vulgaris* L., *Spec.*, 472.—DC., *Fl. Fr.*, iv. 627.—REICHB., *Ic.*, f. 4486.—W., *Arb.*, 34.—POIT. & TURP., *Arbr. Fruit.*, 59.—DC., *Prodr.*, i. 105, n. 1.—MÉR. & DEL., *Dict. Mat. Méd.*, i. 576.—GUIB., *op. cit.*, 725, fig. 771.—A. RICH., *Elém. Hist. Nat. Méd.*, éd. 4, ii. 460.—PEREIRA, *Elem. Mat. Med.*, ed. 4, ii. p. ii. 665.—LINDL., *Fl. Med.*, 63.—ROSENTH., *Syn. Pl. Diaphor.*, 621.

[2] ROYLE, *Ill. Himal.*, 64; in *Trans. Linn. Soc.*, xvii. 83; in *Ann. Sc. Nat.*, sér. 2, ii. 181.—*B. tinctoria* LESCHEN.—*B. Chitria* HAM.—*B. umbellata* LINDL.

at from 5000 to 8000 feet; and *B. pinnata* is prevalent at from 6000 to 7000 feet. LESCHENAULT DE LA TOUR found *B. tinctoria*, which is the same as *B. asiatica*, at the Neilgherries in 11° of latitude at 8000 feet of elevation." In discussing the opinions of authors on the origin of *Lycium*, ROYLE remarked that there was no trace of a description of a *Berberis* in DIOSCORIDES. Curious to know whether the Arabs or Persians had written thereon, he investigated their literature; found good descriptions of *Berberis*, named *Amburbarees*, by AVICENNA, with the Persian synonymes *Zerishk*, *Zurunj*, and *Zurak*, words referring to the yellow colour of the wood and the flowers. In India two useful species of *Berberis* are distinguished "by the names of *Kushmul*[1] and *Chitra*. The former growing at low elevations (3000 feet), and therefore easily acclimated in the plains of India, has the leaves and branches paler-coloured, more thorny; flowers numerous; racemes erect, appearing earlier in the season, and having less pleasant tasted fruit; while *Chitra*, which I conceive to be the true *B. aristata*,[2] I have not found below 5000 feet of elevation, with brownish coloured branches, smooth shining and almost entire leaves, each flower much larger than those of *Kushmul*, though less numerous, on each of the drooping racemes. The fruit of this species, as well as that of *B. nepalensis*, is dried as raisins are in the sun and sent down into the plains for sale." In our days berberine has been used under the name of *quinoide* as a succedanæum of quinine in cases of intermittent fever, neuralgia, &c. The root of the *Berberis* has been fraudulently substituted for Rhubarb and for Pomegranate.[3] The leaves and berries are acidulous. From the latter are prepared wine, a syrup, and very pleasant subacid preserves.[4] The sugar contained in the pericarp makes it afford a fermented liquor. This is especially the case with the *Mahonias*,[5]

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[1] This is the true *B. Lycium* ROYLE (*B. angustifolia* ROXB., *Fl. Ind.*, ii. 183?—*B. floribunda* WALL., *Cat.*, n. 1474?). It is chiefly used for making *ruzot* in the Gursawal and at Sirmore.

[2] DC., *Syst.*, ii. 8; *Prodr.*, i. 108 (*B. Chitria* DON, *Tent. Fl. Nepal.*, 204;—HOOK., *Exot. Fl.*, t. 98). "Arab. *Amburbarees*; Pers. *Zirishk*. The wood is named *Dar-Kuld* or *Darchob*; the extract *hooziz*, in Hindoo *ruzot*."

[3] GUIBOURT (*Drog. Simpl.*, ed. 6, iii. 282) has given their distinctive characters.

[4] The same properties are found in the acidulous edible fruits of *B. asiatica* ROXB. (*hypoleuca* LINDL.), *canadensis* MILL., *emarginata* W., *empetrifolia* LAMK., *glauca* H. B. K., *ilicifolia* FORST., *lutea* R. & PAV., *microphylla* FORST., *minor* FORST., *sibirica* PALL., *sinensis* DESF., *tomentosa* R. & PAV.

[5] Notably *M. Aquifolium* NUTT. (*Berberis Aquifolium* PURSH), of North America; *M. nepalensis* DC. (*B. nepalensis* SPRENG.), and *fascicularis* DC. (*B. pinnata* LAGASC.), frequently cultivated in our gardens.

which, planted in the most uncultivated spots, may produce an abundance of berries; these may when fermented give 8 per cent. of alcohol, while the roasted seeds are said to be a good substitute for coffee. The root and bark of most of the species of *Berberis* are prized for dyeing and for the preparation of morocco. The spiny species, whose leaves are eaten by cattle, while the young shoots are fit for human food, grow easily in arid and chalky soils where hardly any other shrub will prosper, and they make excellent hedges. Unfortunately there can be no doubt of their bad influence on cereals; subject to the attacks of the fungus, *Æcidium Berberidis*, the Berberries may communicate one form thereof to our most useful grasses.

The *Podophyllums* have also edible berries, termed May-apple and Mandrake in the United States.[1] The stock of *P. peltatum*[2] is an evacuant, a drastic purge of pretty rapid effect. A resin extracted therefrom by alcohol, improperly named *podophylline*, serves the same end. *Jeffersonia diphylla*[3] is also used in medicine in the United States; its blackish rhizome is purgative, prescribed in rheumatism and syphilis. The uses of *Leontice* are different. The Mediterranean species, *L. Leontopetalum*,[4] is used in itch in the East. It was formerly recommended in neuralgia and snake bites. The natives call it *Moiadé*, and its soapy stock, called *Ischar* or Levant-Soapwort (*Saponaire du Levant*), is said to be used to clean woollens and cashmeres. *L. Chrysogonum*[5] has also a soapy mucilaginous root; it is perhaps to be considered the *Leontice* of DIOSCORIDES. Its leaves are edible, prized as a vegetable by the Arabs. *L. thalictroides*,[6] from North America, is valued by the Indians. Its root is considered a

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1 The fruit of *P. peltatum*, whereof *P. montanum* RAFIN., and *callicarpum* RAFIN. are probably mere forms. *P. hexandrum* ROYLE (*P. Emodi* WALL.), of the Himalayas, is also prized for its berries. Its leaves are said to be poisonous.

2 L., *Spec.*, 722.—BART., *Mat. Med.*, ii. t. 25.—BIGEL., *Med. Bot.*, ii. t. 23.—PEREIRA, *Elem. Mat. Med.*, ed. 4, ii. p. ii. 701.—LINDL., *Fl. Med.*, 13.—GUIB., *op. cit.*, 724.—ROSENTH., *op. cit.*, 620.

3 PERS., *Syn.*, i. 418.—DC., *Prodr.*, i. 111.—SIMS, in *Bot. Mag.*, t. 1513.—GUIB., *op. cit.*, 724.—ROSENTH., *op. cit.*, 620.—*J. Bartonis* MICHX.—*Podophyllum diphyllum* L. (See pp. 58, 59, figs. 70, 71.)

4 L., *Spec.*, 448.—LAMK., *Dict.*, iii. 465; *Ill.*, t. 254, fig. 1.—DC., *Prodr.*, i. 109, n. 2.—H. BN., in *Dict. Encycl. des Sc. Méd.*, sér. 2, ii. 159.

5 L., *Spec.*, 447.—DC., *Prodr.*, n. 1.—*Chrysogonum Dioscoridis* RAUW., *It.*, 119.—*Bongardia Chrysogonum* SPACH, *Ill. Pl. Or.*, iv. t. 396.—H. BN., in *Dict. Encycl. des Sc. Méd.*, x. 66.—*B. Rauwolfii* C. A. MEY., *Enum. Pl. Cauc.*, 174.—*B. Olivieri* C. A. MEY., *loc. cit.*

6 L., *Spec.*, 448.—DC., *Prodr.*, n. 5.—*Caulophyllum thalictroides* MICHX., *Fl. Bor. Amer.*, i. 205, t. 21.—ROSENTH., *Syn. Pl. Diaphor.*, 621.—GUIB., *op. cit.*, 724.—BENTLEY, in *Pharm. Journ.*, iv. 52.

demulcent and emmenagogue; it is used in neuralgia and rheumatism, and to facilitate parturition. The roasted seeds may be substituted for coffee. Several species of *Epimedium*, especially *E. alpinum*,[1] are thought useful in the treatment of pulmonary disorders. *Lardizabaleæ* have few therapeutical virtues. But we find edible fruits in *Lardizabala triternata* and *trifoliata*, *Holbœllia latifolia*[2] and *angustifolia*, *Burasaia madagascarensis*, *Stauntonia hexaphylla*, and *Akebia quinata*.[3] The stems of these Lianas serve well for cordage. Their flowers are often scented, especially in *Holbœllia latifolia*, which smells like orange-flowers. Several species are cultivated for ornament, like *Berberidopsis corallina*, *Nandina domestica*, and the numerous species of *Berberis*, *Mahonia*, and *Epimedium* planted in our parks and gardens.

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[1] L., *Spec.*, 171.—LAMK., *Ill.*, t. 83.—DC., *Prodr.*, i. 110, n. 1.—ROSENTH., *op. cit.*, 621.

[2] WALL., *Tent. Fl. Nepal.*, t. 16, 17.—ENDL., *Enchir.*, 418.—LINDL., *Veg. Kingd.*, 304.—*Gooplea*, *Baegal* of the Indians.

[3] See ROSENTH., *op. cit.*, 585.

GENERA.

I. LARDIZABALEÆ.

1. **Lardizabala** R. & PAV.—Flowers diœcious. Sepals 6, 2-seriate, petaloid. Petals 6, 2-seriate, much smaller. Stamens 6, 1-adelphous free (sterile in female flower); anthers extrorse, 2-rimose, apiculate or muticous. Carpels 3, free, rudimentary in male flower. Stigma sessile, conical. Ovules ∞, anatropous, inserted on wall in 5–8 series, more rarely in 2 lateral series (*Boquila*), scarcely sunk in the cellular endocarp. Berries 1–3, indehiscent. Seeds ∞, subreniform; albumen abundant, subcorneous, embryo minute excentric.—Climbing shrubs, leaves alternate, usually 2-stipulate, 3-foliolate (*Boquila*), or 2, 3-ternate; leaves penni- or sub-tripli-nerved; flowers axillary; male flowers in racemes or 1–3; female flowers usually solitary (*Chili, Peru*). See p. 43.

2. **Parvatia** DCNE.—Flowers monœcious, almost of *Lardizabala*. Ovules ∞, few scattered on sides of both walls, at length sunk in pulpy hairs. Berries ovate; seeds ∞, sunk in pulp.—A climbing shrub; leaves alternate, exstipulate, pinnately 3-foliolate; flowers in axillary racemes (*India*). See p. 44.

3. **Decaisnea** HOOK. F. & THOMS.—Flowers polygamous. Sepals 6, petaloid, narrow. Petals 0. Stamens 6 (of *Lardizabala*). Carpels 3 (rudimentary in male flower); stigma obovate-oblong. Ovules ∞, ventral, in 2 series. Berries finally gaping. Seeds ∞, embedded in pulp.—An erect shrub; leaves alternate, pinnate; flowers in terminal racemes (*Himalaya*). See p. 44.

4. **Stauntonia** DC. — Flowers monœcious. Sepals 6, 2-seriate outer 3, broader. Petals 0. Stamens 6 (of *Lardizabala*); filaments 1-adelphous; anthers apiculate (barren in female flower). Carpels 3 (rudimentary in male flower); stigma subcapitate; ovules ∞ attached to hairy or cellular wall, ∞-seriate. Berries subglobular, finally gaping; seeds ∞, immersed in pulp.—Climbing shrubs;

leaves digitate 3–7-foliolate; flowers in axillary racemes (*China, Japan*). See p. 45.

5. **Holbœllia** WALL.—Flowers monœcious. Sepals 6, 2-seriate; outer 3 valvate. Petals 6, small (very small in female flower). Stamens 6, free; anthers (small barren in female flower) apiculate extrorse 2-rimose. Carpels 3 (or 4–6; rudimentary in male flower); ovules ∞, attached to pilose wall, ∞-seriate. Berries oblong indehiscent; seeds ∞, immersed in pulp.—Climbing shrubs; leaves digitate 3–7-foliolate; flower in 1- or 2-sexual racemes; pedicels subtumid; articulate at base (*Himalaya*). See p. 45.

6. **Akebia** DCNE.—Flowers monœcious; sepals 3 or more rarely 4–6, petaloid subvalvate. Petals 0. Stamens of male flower 6 or more rarely 3–12; filaments short, free, shortly expanding into subclavate anther; cells 2, linear extrorse rimose. Rudimentary carpels 2–6. Stamens of female flower small, sterile, 3–9. Carpels 3–12, free; ovules ∞, inserted on papillose wall; style short, finally subpeltate, stigmatose. Berries large; dehiscence follicular. Seeds ∞, immersed in pulpy involute endocarp; albumen abundant; embryo oblique, subapiculate, small. — Climbing shrubs; leaves alternate digitate 3–5-foliolate; flowers in axillary racemes; female flowers inferior (*China, Japan*). See p. 46.

II. ERYTHROSPERMEÆ.

7. **Erythrospermum** LAMK.—Flowers hermaphrodite, or more rarely subpolygamous. Leaves of perianth 7–13, ternately 3–5-seriate, unequal, imbricate, increasing in size and more petaloid inwards. Stamens 5–9; filaments slender, free, subsagittate; cells marginal linear, longitudinally rimose at sides. Germen free, 1-locular; apex produced into a short subentire or 3, 4-fid stigmatose style; placentas parietal 3 or more rarely 4; ovules ∞ anatropous. Fruit thick, at length with 3, 4 valves; seeds ∞, surrounded by pulp; embryo small, straight or slightly incurved.—Trees or shrubs; leaves entire alternate subopposite or verticillate; flowers in simple or branched axillary or terminal racemes (*Madagascar, insular*). See p. 48.

8. **Berberidopsis** Hook. f.—Flowers hermaphrodite; leaves of perianth 9–15, petaloid, unequal imbricate larger from without inwards. Stamens 6–10; filaments free, very short, inserted above a rather prominent ring of receptacle; anthers basifixed erect 2-celled subintrorse rimose. Germen free, 1-celled, tapering into a short truncate 3-radiate stigmatiferous style; placentas 3, parietal; ovules ∞, anatropous. Fruit . . . ?—A shrub, subsarmentose evergreen; leaves alternate simple petiolate exstipulate, coarsely dentate; flowers in terminal or subumbelliform drooping racemes; bracts to each flower; pedicels 2-bracteolate at base (*Chili*). See p. 49.

III. BERBERIDEÆ.

9. **Berberis** L.—Flowers 3-merous; leaves of petaloid calyx 6–12, 2–4-seriate, larger from without inwards (outer small, bract-like), imbricate. Petals 6, 2-seriate, often subsimilar to sepals, usually 2-glandular within at base imbricate. Stamens 6, 2-seriate, filaments free, articulate at base; anthers basifixed 2-celled introrse 2-rimose; outer wall of each cell eventually dehiscing by upraised valve. Carpel 1; style short; apex peltate, stigmatose. Germen 1-locular; ovules usually few, inserted near base or more or less obliquely on wall of placenta, ascending anatropous; micropyle extrorse inferior. Berry indehiscent. Seeds usually few; albumen fleshy; embryo rather large.—Shrubs; leaves alternate simple (1-foliolate) and penninerved or pinnate; each pinnule articulated to midrib, usually spinose-dentate or transformed into simple or much divided spines; flowers in racemes or solitary or in pairs, terminating the yearly shoots or lateral leafy fascicles (*Europe, Asia, Tropical America*). See p. 49.

10. **Leontice** L.—Sepals 6–9, petaloid; outer ones smaller; imbricate in æstivation. Petals 6, much smaller, like nectaries, truncate or dilated-hooded at apex (*Caulophyllum*), more rarely subsimilar to sepals (*Bongardia*). Stamens 6, free; anthers muticous dehiscing by 2 upraised valves. Carpel 1; ovules 2 or 4–8 inserted on basilar or sublateral placenta, ascending anatropous. Capsule membranous or bladder-like, indehiscent or gaping at apex even before maturity (*Gynmospermium*), or more rarely evanescent (*Caulophyllum*). Seeds

XV. NYMPHÆACEÆ.

I. NELUMBO SERIES.

Nelumbo[1] (figs. 74–81) has regular hermaphrodite flowers. The lower part of the receptacle forms a depressed cone, bearing the

Nelumbo nucifera.

FIG. 74.
Habit ($\frac{1}{10}$).

perianth and androceum. The former is like that of our Water-

[1] T., *Inst.*, 261.—ADANS., *Fam. des Pl.*, ii. 76.—GÆRTN., *Fruct.*, i. 73, t. 19.—MIRB., in *Ann. Mus.*, xiii. 465, t. 34; xvi. 448, t. 19.—H. BN., in *Adansonia*, x. i. t. 3.—*Nelumbium* J., *Gen.*, 68.—LAMK., *Dict.*, iv. 453; Suppl., iv. 78; *Ill.*, t. 463.—TURP., in *Ann. Mus.*, vii. 210, t. 11.—POIT., in *Ann. Mus.*, xiii. 359, t. 29.—CORREA, in *Ann. Mus.*, xiv. 74, t. 8.—RICH., in

lilies, consisting of four[1] unequal imbricate-decussate sepals, and an indefinite number of imbricated dissimilar sepals arranged along a spiral with very close turns.[2] The stamens, inserted along the continuation of this spiral, are also indefinite in number, each formed of a free filament and a basifixed introrse anther, with two linear cells of longitudinal dehiscence, surmounted by a long nearly club-shaped process of the connective.[3] Above the androceum the re-

Nelumbo nucifera.

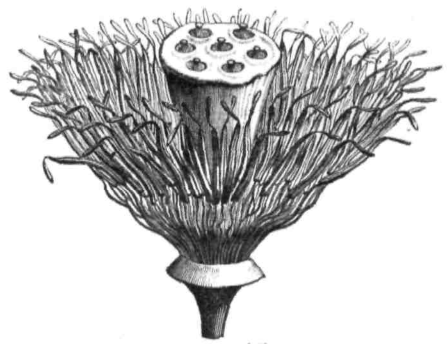

FIG. 75.
Flower without perianth.

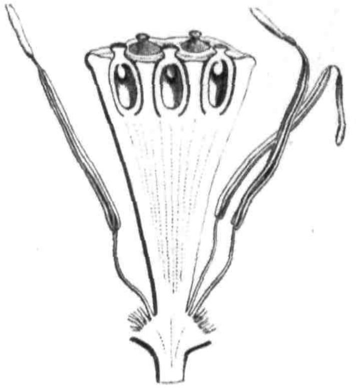

FIG. 76.
Long. sect. of the gynæceum.

ceptacle expands into a large inverted cone (figs. 75, 76), whose upturned base is hollowed into a variable number of alveoli (from five to seven), with circular mouths. Each of these includes a small non-adherent carpel, formed of a unilocular ovary, surmounted by a short style with exserted and capitate stigmatiferous apex.[4] The ovary has near the upper part of its back a gibbosity,[5] and contains a sub-apical placenta, which gives insertion to a usually single[6] descending

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Ann. Mus., xvii. 249, t. 9.—DC., *Syst.*, ii. 43; *Prodr.*, i. 113.—SPACH, *Suit. à Buffon*, vii. 180.—ENDL., *Gen.*, n. 5026.—B. H., *Gen.*, 47, 965, n. 8.—DCNE. & LEM., *Traité Gén. de Bot.*, 402.—*Cyamus* SM., *Exot. Bot.*, i. 59, t. 31, 32.

1 More rarely five.

2 We take the view that, as in *Nymphæa*, they represent metamorphosed stamens.

3 The pollen consists of oval grains with longitudinal grooves (H. MOHL, in *Ann. Sc. Nat.*, sér. 2, iii. 33). When the anther cells open the lips of each cell roll up, one inside, one outside. The clubs surmounting the connective are often folded inwards. Finally both these prolongations and the filaments themselves are often twisted.

4 The study of development has shown us that the carpels are at first free, as in a Ranunculad, inserted on a broad depressed receptacle, but later on this grows and rises up between the carpels, forming by its enlargement around them the wells whose mouth is occupied by the style.

5 The top of which bears a little glandular surface.

6 Some observers have occasionally seen two ovules.

anatropous ovule,[1] whose micropyle usually looks upwards and inwards.[2] The fruit is multiple, formed of a variable number of carpels lodged in the cavities of the now woody receptacle. Each carpel has a dry indehiscent or imperfectly dehiscent pericarp, *containing one suspended seed.* Within the spongy seed-coat is a large exalbuminous embryo. Its two cotyledons form by their approximation a fleshy mass, in the centre of which is a highly developed gemmule, with alternate green leaves, inflexed above[3] (fig. 78). *Nelumbo* consists of aquatic perennial herbs. The stem forms a thick rhizome, creeping in the mud, and bearing alternate polymorphous

Nelumbo nucifera.

FIG. 77.
Achene.

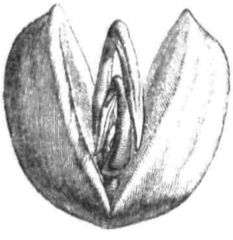

FIG. 78.
Embryo ($\frac{2}{1}$).

Nelumbo lutea.

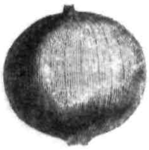

FIG. 80.
Achene ($\frac{2}{1}$).

FIG. 79.
Multiple fruit ($\frac{2}{5}$).

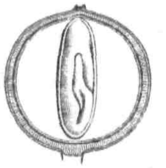

FIG. 81.
Long. sect. of achene.

leaves; one kind are short and scale-like, hidden close to the stock under water; the others emerge, and are peltate, with long petioles.[4]

---

[1] With two coats.

[2] B. CLARKE has put an interpretation of his own on the floral organization of *Nelumbo;* he considers that the carpels are female flowers, with the back of the ovary turned towards the centre of the flower (in *Journ. Bot.* (1865), 127; *A New Arrang.*, 27).

[3] In each leaf may be distinguished the petiole and blade, and even sometimes its axillary bud. Hence this embryo represents a complete plant on a small scale.

[4] TRÉCUL has made special researches (in *Bull. Soc. Bot. de Fr.*, i. 18, 60; in *Ann. Sc. Nat.*, sér. 4, i. 291) on the abnormal arrangement of the leaves and stipules of *N. codophyllum* (the same as *Nelumbo lutea,* — *Nelumbium luteum* W.). He thinks it a mistake to consider the hyaline membrane that surrounds the gemmule in the seed (fig. 81) a stipule. As regards the leaves he admits that they have three stipules, one axillary, and two others which he terms extrafoliar. Moreover, all the leaves are unilateral. He shows that the two extrafoliate stipules are the axillary stipules of two aborted leaves.

Each flower is borne on a long peduncle.[1] Only two species of this genus are known: one, *N. lutea*,[2] with yellow flowers, is American; the other, *N. nucifera*,[3] with white or pink flowers, is found in the fresh waters of the tropical and subtropical regions of the Old World.

II. CABOMBA SERIES.

Cabomba[4] (figs. 82–86) has regular hermaphrodite flowers. The

Cabomba aquatica.

FIG. 82.
Habit.

FIG. 84.
Diagram.

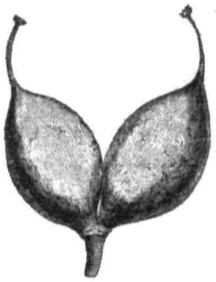

FIG. 86.
Fruit ($\frac{4}{1}$).

very small convex receptacle bears a corolla, a calyx, a whorl of

---

[1] The position of this peduncle is singular. I have always seen it placed between the back of a leaf (axillary to which is, on the other side, a bud) and the upper surface of another appendage like a bract or stipuliform appendage, to which the leaf is superposed.

[2] *Nelumbium luteum* W., *Spec.*, ii. 1259.—DC., *Prodr.*, i. 114, n. 2.—TORR., *Gen. Pl. Fl. Amer. Bor.*, i. 97, t. 40, 41.—WALP., *Rep.*, i. 105; *Ann.*, ii. 24.—? *N. pentaphyllum* W., *loc. cit.*—*N. codophyllum* RAFIN., *Fl. Ludov.*, 22, n. 64.—*N. jamaicense* DC., *Syst.*, ii. 47; *Prodr.*, n. 5.

[3] GÆRTN., *loc. cit.*—CASP., in *Ann. Mus. Lugd.-Bat.*, ii. 242.—*Nelumbium speciosum* W., *Spec.*, ii. 1258.—ROXB., *Fl. Ind.*, 647.—DC., *Prodr.*, n. 1.—HOOK. F. & THOMS., *Fl. Ind.*, i. 248.—WALP., *Rep.*, i. 105; *Ann.*, ii. 24, n. 2; iv. 151, n. 1.—*N. asiaticum* RICH., in *Ann. Mus.*, xvii. 249, t. 9.—*N. indica* POIR., *Dict.*, iv. 453.—*N. caspicum*.—*Cyamus Nelumbo* SM., *Exot. Bot.*, i. 59, t. 31, 32.—*C. mysticus* SALISB., *Ann. Bot.*, ii. 75.

[4] AUBL., *Guian.*, i. 321, t. 124.—J., *Gen.*, 46.—L. C. RICH., in *Ann. Mus.*, xvii. 230, t. 5,

stamens, and one of carpels. The calyx consists of three petaloid sepals, imbricated or twisted in the bud; the corolla of three alternating, usually smaller petals, also imbricated or twisted in præfloration. The stamens are three in number, superposed to the sepals; or else, through deduplication, each is replaced by a pair.[1] Each stamen consists of a free hypogynous filament, and an extrorse two-celled

Cabomba aquatica.

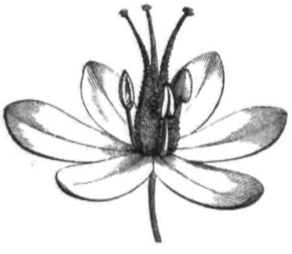

FIG. 83.
Flower ($\frac{3}{1}$).

FIG. 85.
Long. sect. of flower.

anther of longitudinal dehiscence. The gynæceum normally consists of three free carpels[2] superposed to the petals, each formed of a one-celled ovary tapering above into a style which ends in a little stigmatiferous head. Around the gynæceum is a little papillose disk. Each ovary contains from two to four descending anatropous ovules inserted on its walls, with their micropyles upwards and outwards.[3] The fruit (fig. 86) consists of a few drupaceous carpels, within whose thin mesocarp are one or two one-seeded stones.[4] The seed is suspended anatropous, and contains within its coats a copious farinaceous albumen. At its apex is seen another, relatively smaller, fleshy albumen, surrounding a little embryo with a short superior radicle,

fig. 23; *Anal. du Fruit*, 46, 61, 62, 64.—TURP., in *Dict. Sc. Nat.*, ii. t. 80.—DC., *Syst.*, ii. 36; *Prodr.*, i. 112.—SPACH, *Suit. à Buffon*, vii. 161.—ENDL., *Gen.*, n. 5024.—B. H., *Gen.*, 46, n. 1.—*Nectris* SCHREB., *Gen.*, n. 610.—NUTT., *Gen. Amer.*, i. 230.

[1] There are hence often six stamens, as in fig. 84, or three, as in fig. 83, or only four or five, deduplication of all the stamens not being constant.

[2] Some flowers have only two; others have four.

[3] They have been described by most authors as orthotropous, and they are so sometimes, as shown in fig. 85. But we have demonstrated (in *Adansonia*, ix. 374) that this is only due to arrest of development, and should be regarded as exceptional. Normally the final direction of the micropyle is superior, and SCHLEIDEN made no mistake.

[4] These hardened parts of the endocarp have often been described and figured as forming a seed-coat.

and two large inferior cotyledons. *Cabomba* consists of aquatic herbs, whose stock bears herbaceous branches, covered, like all parts of the plant, with a mucilaginous juice, and bearing the leaves. The lower leaves are submerged and the digitiveined blade is reduced to its ramified veins; the upper ones are peltate and float on the surface (fig. 82). The flowers, white or yellow, rise into the air to expand; they are solitary axillary on long peduncles. Two or three species of this genus are known, all natives of the warm parts of America.[1]

Brasenia[2] comes very near *Cabomba*, whereof it has the general organization: it differs in three points; all its leaves are floating and peltate; the indefinite stamens have lateral anther-cells; and there are six or more carpels. The only known species[3] has been observed in the fresh waters of nearly all tropical regions, in America, Asia, and Oceania.

III. WATER-LILY SERIES.

Two species of Water-lily (Fr., *Nénuphar*) are best known in Europe: the White and the Yellow. The latter has been made the type of the genus *Nuphar*,[4] and with it we shall commence the study of this series. *N. luteum*[5] (figs. 87–92) has regular hermaphrodite flowers. The receptacle is convex, and bears a double perianth, the androceum, and the gynæceum. The calyx usually comprises five[6] somewhat dissimilar sepals,[7] quincuncially imbricated in the bud. The petals are numerous, small, and somewhat fleshy, inserted along

[1] TORR. & GR., *Fl. N.-Amer.*, i. 54.—WALP., *Rep.*, i. 105.

[2] SCHREB., *Gen.*, 372. — ENDL., *Gen.*, n. 5025.—A. GRAY, *Gen. Ill.*, t. 39.—B. H., *Gen.*, 46, n. 2.—*Ixodia* SOLAND., mss. (ex ENDL.).—*Hydropeltis* L. C. RICH., in *Ann. Mus.*, xvii. 230, t. 5, fig. 22.—MICHX., *Fl. Bor.-Amer.*, i. 323, t. 29.—DC., *Syst.*, ii. 38; *Prodr.*, i. 112.

[3] *B. nymphoides.*—*B. peltata* PURSH, *Fl. Amer. Bor.*, ii. 389.—WALP., *Rep.*, i. 105; *Ann.*, iv. 150. — *Menyanthes nymphoides* THUNB., *Fl. Jap.*, 82.—*Limnanthemum peltatum* GRISEB., in DC., *Prodr.*, ix. 141 (ex PL., in *Ann. Sc. Nat.*, sér. 4, ii. 257).—*Hydropeltis purpurea* L. C. RICH., *loc. cit.*

[4] SM., *Prodr. Fl. Græc.*, i. 361.—DC., *Syst.*, ii. 59; *Prodr.*, i. 116.—SPACH, *Suit. à Buffon*, vii. 174.—ENDL., *Gen.*, n. 5021.—A. GRAY, *Gen. Ill.*, t. 44.—B. H., *Gen.*, 46, 965, n. 3.—*Nymphosanthus* RICH., *Anal. du Fruit*, 68 (nec LOUR.).—*Nenuphar* HAYN., mss. (ex ENDL.).

[5] SM., *loc. cit.*—DUB., *Bot. Gall.*, 20.—TRÉCUL, in *Ann. Sc. Nat.*, sér. 3, iv. 286, t. 10–13.—GREN. & GODR., *Fl. de Fr.*, i. 56.—*Nymphæa lutea* L., *Spec.*, 729; *Fl. Dan.*, t. 603.

[6] Sometimes four or six.

[7] They become broader, thinner, yellower and more petaloid, as they are more enfolded in the bud; the exposed parts remain green and thick.

a spiral and imbricated in the bud.[1] The stamens, also indefinite, are hypogynous, dissimilar,[2] each formed of a free filament and an introrse two-celled anther, dehiscing by two longitudinal clefts.[3] The superior gynæceum consists of a many-celled ovary, surmounted

Nuphar luteum.

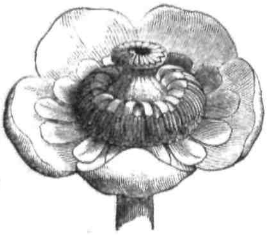

FIG. 87.
Flower ($\frac{2}{3}$).

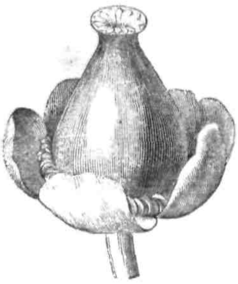

FIG. 90.
Fruit ($\frac{1}{2}$).

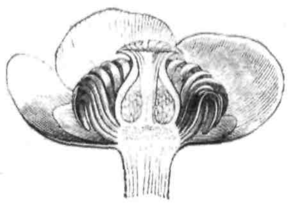

FIG. 89.
Long. sect. of flower.

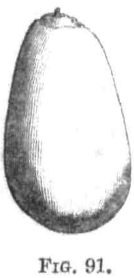

FIG. 91.
Seed ($\frac{6}{1}$).

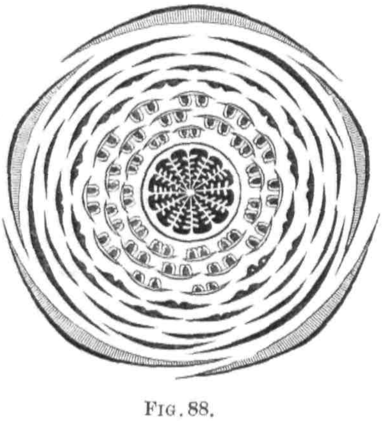

FIG. 88.
Diagram.

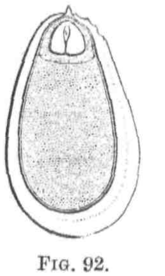

FIG. 92.
Long. sect. of seed.

by a style, whose expanded surface bears as many stigmatiferous rays as there are cells. These last contain each an indefinite number

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[1] PAYER (*Traité d'Organog. Compar.*, 269, t. 59) has studied the development and arrangement of these leaves; he admits that at least the greater part are metamorphosed stamens, and that the flowers are double, as in *Nymphæa*. In fact, we see on the inner surface of the innermost petals, shorter and fleshier than the rest, two projections, which look like representatives of anther-cells.

[2] The more internal they are the narrower are their filaments, and the closer together their anther-cells.

[3] The pollen is at first elliptical (TRÉC., *loc. cit.*, 324); later on its grains become rounded, and bristle with conical points.

of descending anatropous ovules inserted on the side walls of the cells, with the raphe looking towards the median plane of the cell; while the micropyle is upwards, close under the attachment of the ovule, and against the dissepiment.[1] The fruit is a many-seeded berry; it however finally opens, each carpel separating from the epicarp and its neighbours by the splitting of the dissepiment.[2] The seeds, plunged in a gummy mucus that fills the cells of the fruit, contain within their coats a large farinaceous albumen, at whose apex is seen a much smaller fleshy albumen, surrounding the embryo (fig. 92). This is short and stumpy, consisting of a very short tigellum and superior radicle, and two large cotyledons lodging in their hollow the gemmule, wherein two leaves are usually distinguishable. The part of the seed lodging in the embryo is protected by a little, circular, valve-like lid (fig. 91), which, at a certain period, may come off from the rest of the seed-coats. *Nuphar* consists of herbaceous perennials, inhabiting fresh water. The stem is a thick rhizome, creeping in the mud, and bearing the scars of adventitious roots and of leaves. The leaves are alternate exstipulate, with long petioles, and peltate floating blades, cordate at the base.[3] The flowers are yellow, solitary or geminate,[4] supported on long peduncles; they expand in the air, where they ripen their fruit. Three or four species are known,[5] inhabiting the extratropical regions of the Northern Hemisphere in both Worlds.

The White Water-lily[6] (Fr., *Nénuphar blanc*) has been left the type of the genus *Nymphæa*[7] (figs. 93–98). Here the receptacle assumes the form of a rather deep cup, containing the greater part of the

[1] They have two coats.

[2] "Carpels ∞, immersed in a thick annular torus, and concrete therewith into an ∞-locular ovary" (B. H., *Gen.*, loc. cit.). TRÉCUL (*loc. cit.*, 326) has fully studied the septicidal dehiscence of the fruit. I do not think that any part of the receptacle enters into the formation of the walls of the gynæceum.

[3] For the detailed study of all these parts and the development of the vegetative organs see TRÉCUL's memoir (*loc. cit.*, 287, 293, 305).

[4] "I have not been able to recognise the inflorescence; the flowers are grouped in pairs, with one larger than the other, but whether they arise from the axils of the leaves, as in *Nymphæa alba*, I am unable to say" (PAYER, *loc. cit.*, 269).

[5] DELESS., *Ic. Sel.*, ii. t. 6.—PURSH, *Fl. Bor.-Amer.*, ii. 370.—AIT., *Hort. Kew.*, ed. 2, iii. 295.—PL., in *Ann. Sc. Nat.*, sér. 3, xix. 57.—CASP., in *Ann. Mus. Lugd.-Bat.*, iii. 254, t. 8.—WALP., *Ann.*, iv. 168; vii. 76.

[6] *Nymphæa alba* L., *Spec.*, 729.—DC., *Prodr.*, n. 14.—GREN. & GODR., *Fl. de Fr.*, i. 156.

[7] T., *Inst.*, 260, t. 137, 138 (part.).—L., *Gen.*, n. 653 (part.).—NECK., *Elem.*, n. 1828.—RICH., *Anal. du Fruit*, 69.—DC., *Syst.*, ii. 49; *Prodr.*, i. 114.—SPACH, *Suit. à Buffon*, vii. 167.—ENDL., *Gen.*, n. 5020.—PAYER, *Organog.*, 269, t. 59.—PL., in *Ann. Sc. Nat.*, sér. 3, xix. 30.—A. GRAY, *Gen. Ill.*, t. 42, 43.—B. H., *Gen.*, 46, 965, n. 4.—*Leuconymphæa* BOERH., *Lugd.-Bat.*, 364.—*Castalia* SALISB., in *Kœn. Ann.*, ii. 71; *Par. Lond.*, n. 14, 68.

adherent ovary, while the perianth and androceum are inserted on its outside. The calyx is quite inferior, composed of four imbricate sepals. The petals are indefinite in number, imbricated, and unequal, becoming more similar to stamens as they are higher up.[1]

Nymphæa alba.

FIG. 93.
Flower (½).

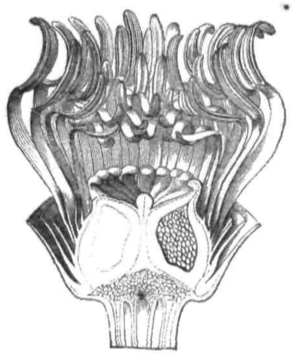

FIG. 94.
Long. sect. of flower (perianth removed).

The stamens, also indefinite in number, are free, with a filament which is the broader and the more petaloid as it is the nearer the corolla, and an introrse, basifixed, two-celled anther, of longitudinal dehiscence.[2] The gynæceum consists of a large number of carpels,[3] emerging by their upper part from the receptacular sac, and forming around a central, conical, or globular process of the receptacle a style, whose branches cohere into a funnel, and each end by a fleshy incurved head. In each cell of the ovary are found indefinite ovules, arranged as in *Nuphar*. The fruit is a spongy berry, covered on the outside by the scars of the perianth and androceum (fig. 95).[4] It finally opens irregularly to free a large number of seeds, immersed

---

[1] "The corolla of *Nymphæa alba* is composed of the petals of the corolla proper, alternate with the sepals, and of a large number of other petals, which are only metamorphosed stamens. . . . . The flower of *N. alba* is therefore a *double* flower in fullest sense of the word, but it is a *normally double flower*, since it is not through cultivation that it has become such" (PAYER, *loc. cit.*, 270).

[2] The pollen is ovoidal, with a longitudinal groove, and small spines in *N. alba*; hemispherical, with a circular groove, in *N. Lotus* (H. MOHL, in *Ann. Sc. Nat.*, sér. 2, iii. 311).

[3] Often from twelve to twenty.

[4] It is surmounted by a sort of crown formed of the indurated incurved stylar branches.

in a gummy substance, that exudes into the cells. Each seed is surrounded by a membranous sacciform aril, springing from around the insertion of the funicle,[1] and open below. Within the coats is a double albumen and a small embryo, resembling the same organs in

Nymphæa alba.

FIG. 95.
Fruit.

FIG. 96.
Seed without its aril ($\frac{8}{1}$).

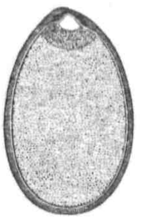

FIG. 97.
Long. sect. of seed.

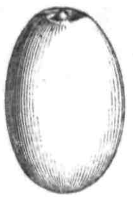

FIG. 98.
Seed, coats removed.

Nuphar. Some twenty species of *Nymphæa* are known,[2] inhabiting all the tropics and the various parts of the Northern Hemisphere. The vegetative organs and inflorescence are the same as in *Nuphar.* Their flowers are large and handsome, white, pink, red, or blue, and the fruits ripen under water.

In *Barclaya,*[3] the floral receptacle forms a nearly cylindrical tube, lodging the gynæceum below, while the upper part gives insertion to the stamens on the inside, and by its mouth to an indefinite number of perianth leaves. Most authors consider this superior perianth as a polypetalous imbricated corolla, and regard the calyx as represented by five leaves inserted right at the base of the receptacular tube.[4] The stamens are numerous, spirally disposed;

---

[1] MIRB., *Nouv. Rech. d'Organ. Vég.*, t. 6, fig. 15, 16.—PL., *Dév. et Car. des Ar.*, 17. Hence to form the pulp inside the fruit there is something besides the gummy mucilage also found in *Nuphar*, and mentioned by CARUEL (in *Ann. Sc. Nat.*, sér. 4, xii. 77).

[2] Divided into 4 sections: 1. *Lotos;* 2. *Cyanea;* 3. *Hydrocallis;* 4. *Castalia* (PL., *loc. cit.*, 32).—DELESS., *Icon. Sel.*, ii. t. 5.—CASP., in *Annal. Mus. Lugd.-Batav.*, ii. 243, t. 7.—WALP., *Ann.*, iv. 153; vii. 76.

[3] WALL., in *Trans. Linn. Soc.*, xv. 442, t. 18.—ENDL., *Gen.*, n. 5022.—HOOK., *Icon.*, t. 809, 810; in *Ann. Sc. Nat.*, sér. 3, xvii. 301, t. 21.—HOOK. F., in *Trans. Linn. Soc.*, xxiii. t. 21.—B. H., *Gen.*, 47, n. 5.—WALP., *Ann.*, iv. 167.

[4] W. HOOKER formerly considered these an involucre, an interpretation which has been contested by other authors (PL., in *Ann. Sc. Nat.*, sér. 3, xix. 57).

the form of the stamens,[1] *Victoria* comes so near *Euryale*, that we can only make it a distinct section. Thus constituted, *Euryale* includes two species of aquatic plants, that vegetate like the water-lilies. The floating blade of the large petiolate leaves is orbicular-peltate, corrugated-bullate above, covered below with a network of very prominent ribs. The various parts of the plant, especially the petioles, veins, peduncles, receptacle, and base of the calyx, are covered with rigid prickles of variable structure.[2] The flowers are solitary on long peduncles; they rise to expand above water, and are more or less pinky in the American species, violet-purple in the Asiatic plant.

IV. SARRACENA SPECIES.

Sarracena[3] (figs. 102–107) has regular hermaphrodite flowers. On the convex receptacle are inserted a calyx of five sepals of imbricated præfloration,[4] and a corolla of five alternating petals of peculiar form,[5] also imbricated in the bud. The stamens are indefinite in number, and hypogynous; each is formed of a free filament and an introrse two-celled anther of longitudinal dehiscence.[6] The gynæceum is superior, formed of an ovary surmounted by a slender cylindrical style, which shortly dilates into a sort of petaloid parasol, with five angles superposed to the sepals. At the apex of each angle is a notch in the bottom of which is a little tubercle projecting downwards, covered with stigmatic papillæ.[7] The ovary is

[1] In *Euryale* proper they possess a more slender filament, and a shorter anther, much more acute at the apex.

[2] Some contain and others lack tracheæ (TRÉC., in *Ann. Sc. Nat.*, sér. 4, i. 156).

[3] T., *Inst.*, 567, t. 476.—ADANS., *Fam. des Pl.*, ii. 450.—*Sarracenia* L., *Gen.*, n. 652.—J., *Gen.*, 435.—LAMK., *Dict.*, vi. 544; Suppl., v. 39; *Ill.*, t. 452.—SPACH, *Suit. à Buffon*, xiii. 329.—ENDL., *Gen.*, n. 5023.—A. GRAY, *Gen. Ill.*, t. 45, 46.—H. BN., in *Adansonia*, i. 210.—B. H., *Gen.*, 48, n. 1.

[4] They persist and thicken a little around the fruit.

[5] The base forms a sort of spoon, with its concavity inwards; above is a contraction topped by a more expanded blade. The spoon part is at first applied pretty closely to the ovary, and the upper part, removed where it is contracted, is above again inclined inwards. The pollen is usually whitish, composed of elongated grains, fusiform, or sometimes as it were truncate at both ends, bearing from three to seven or eight longitudinal grooves. They are often united in variable numbers end to end, thus forming a sort of rod, which comes out of the anther in a single piece. These whitish cylinders then often stick to the inner faces of the petals, opposite the prominences of the stylar expansion which bear the stigmatic papillæ.

[6] The anther is at first straight, but becomes more or less recurved with age, according to the species. Then the upper part of the face turns outwards. When young the stamens are smaller, as they are more external.

[7] In longitudinal section the fibro-vascular

divided by five dissepiments superposed to the petals into as many usually incomplete cells; each of these contains near its ventral angle a bilobed placenta bearing a large number of anatropous

Sarracena Drummondi.

FIG. 102.
Young plant ($\frac{1}{3}$).

Sarracena variolaris.

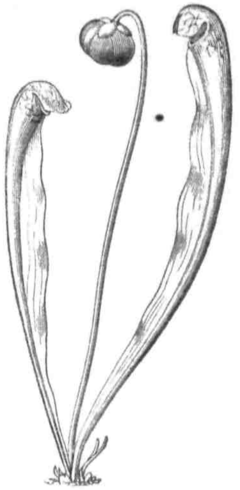

FIG. 103.
Habit ($\frac{1}{6}$).

ovules.[1] The fruit is a loculicidal capsule; the seeds contain within their coats[2] a copious albumen, lodging at the apex a small embryo.[3] *Sarracena* consists of perennial herbs, natives of the marshes of North America. The stock creeps in the mud and bears alternate exstipulate leaves, formed like an elongated urn or irregular cornet,

---

bundles may be seen to divide in the notch, some going towards the edge of the blade, and others bending down to the stigmatiferous tubercle. This last is conical, bearing at its apex a tuft of large bowed conical papillæ.

[1] When the cells are incomplete the septum and its placenta have an arrow-head transverse section. The placentary edges are often incurved or involuted at the insertion of the ovules.

[2] The outer seed-coat of *S. purpurea* is yellowish and almost suberous, with the raphe projecting from it. Inside is a thin translucent membrane.

[3] It is contained in a very distinct chamber. Its small soft translucent cotyledons are often separated from the tigellum by a very fine annular rim.

with a sort of lid over its mouth.[1] The flowers are solitary,[2] drooping at the summit of a long peduncle. This bears below the calyx three

Sarracena purpurea.

FIG. 104.
Habit ($\frac{1}{3}$).

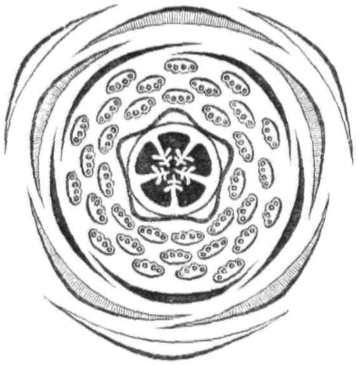

FIG. 106.
Diagram.

FIG. 105.
Flower ($\frac{1}{2}$).

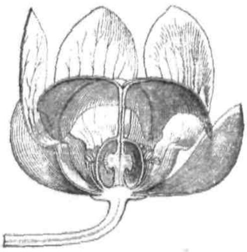

FIG. 107.
Long. sect. of flower.

bracts, which form a sort of calyculus to the flower. Some half-dozen species of *Sarracena* are known.[3]

The flower of *Darlingtonia californica*[4] has the same general or-

[1] These organs form a sometimes very elongated cornet, whose mouth has a dilatation on the outside of variable form, which has often been termed a lid or operculum, with a rather prominent vertical crest running along the whole of the internal angle of its outer surface. Botanists were pretty generally agreed to consider the lid as a blade, the urn representing, as it was thought, a hollow petiole. However, the sheathing concavity of the base of the petiole exists towards the base of the leaf, quite distinct from the cavity of the urn. In tracing the development of these parts (in *Compt. Rend. Ac. Sc.*, lxxi. 630; in *Adansonia*, ix. 331, i. 380) we have seen that the leaf is depressed at the top into a pit, representing the inner or upper surface of the blade, and this pit it is that afterwards deepens, like a peltate leaf, with its concavity immensely exaggerated. The lining membrane of the urn, covered with liquid-secreting hairs, hence must be held to represent the superior epidermis of the leaf. The operculum represents the terminal lobe, more developed than the rest of the edge of this blade, not the whole of the blade itself. The vertical crest along the ventral angle is analogous to the corresponding prominences or ribs which are often seen on the lower surface of the blade of a peltate leaf, extending from the insertion of the petiole to the basilar notch of the blade.

[2] Terminating a large shoot found ending the divisions of the rhizome; the last leaves on them are replaced by bracts. Later on a younger bud seems to be formed on the side of the first, and is also destined to end in a flower. Hence the subterranean axis of *Sarracena* is probably a sympodium.

[3] MILL., *Icon.*, t. 241.—SM., *Exot.-Bot.*, i. t. 53.—MICHX., *Fl. Bor.-Am.*, i. 310.—NUTT., *Gen.*, ii. 10; in *Amer. Phil. Trans.*, ser. 2, iv. 49, t. 1.—DE LA PYLAIE, in *Ann. Soc. Linn. Par.*, vi. 388, t. 13.—HOOK., *Exot. Fl.*, t. 13.—CROOME, in *Ann. Lyc. N.-York*, iv. 98, t. 6.—TORR. & GR., *Fl. N.-Amer.*, i. 58.—*Bot. Mag.*, t. 780, 849, 1710, 3515.—WALP., *Rep.*, i. 108; v. 20; *Ann.*, ii. 25; iv. 169; vii. 82.

[4] TORR., in *Smithson. Contrib.*, vi. 4, t. 12.—B. H., *Gen.*, 48, 965, n. 2.—WALP., *Ann.*, iv.169.

ganization as that of *Sarracena*, but differs in some remarkable points. The gynæceum consists of an obconical ovary of five cells superposed to the petals and surmounted by a style, with five little branches, each rolled up into a tube.[1] The seeds are club-shaped, covered with prickles.[2] The incurved urn that forms the greater part of each leaf is surmounted by a double membranous tongue.

Heliamphora[3] has five (more rarely four) petaloid imbricated sepals, no corolla, an indefinite number of stamens with introrse anthers,[4] and an ovary of three multiovulate cells.[5] The style forms a channelled hollow column, expanding slightly at its apex into a little trilobate ring. The fruit is a loculicidal capsule; the outer seed-coat is loosely reticulated, dilated into a membranous wing. *H. nutans* BENTH., the only known species, is a perennial herb from Mount Roraima, in Venezuela. The leaves are urn-shaped, and the flowers, with drooping pedicels, are collected into small racemes, naked at the base.

SALISBURY, in 1805,[6] made a distinct order of the *Nymphæaceæ*. Before this the water-lilies had been classed by B. DE JUSSIEU[7] in *Papaveraceæ*, by ADANSON[8] in his family "*Aristoloches*," by A. L. DE JUSSIEU[9] in his order *Morrenieæ* between *Hydrocharis* and *Trapa*. Then botanists were generally agreed in referring these plants, whose embryo was very little known, to the Monocotyledons;[10] but there is now no doubt as to their possessing two albumens,[11] whereof the smaller represents the contents of the embryo-sac, and includes an embryo with two quite distinct cotyledons. DE CANDOLLE, in 1824,[12] classed *Nymphæaceæ* just before *Papaveraceæ*, and after *Berberidaceæ* and *Podophyllaceæ*, wherein he placed *Cabombeæ* under the name of *Hydropeltideæ*. He divided *Nymphæaceæ* into two tribes, *Nelumboneæ* and *Nymphæeæ*. ENDLICHER[13] made his class *Nelumbia* of three

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1 Each forms a strap, which is stigmatiferous at its softened apex, and has its edges rolled backwards, and meeting above to simulate a tube.

2 They taper into a tube on the side next the radicle (DCNE. & LEM., *Traité Gén. de Bot.*, 407).

3 BENTH., in *Trans. Linn. Soc.*, xviii. 432, t. 29.—ENDL., *Gen.*, n. 5023[1].—B. H., *Gen.*, 48, n. 3.—WALP., i. 109.

4 Later on they become versatile; the cells terminate below by a very slightly curved mossy point.

5 The ovules are pluriseriate when adult.

6 In *Kœn. Ann. of Bot.*, ii. 69.

7 In *A. L. de Jussieu Gen.*, lxvii. (1759).

8 *Fam. des Pl.*, ii. 71 (1763).

9 *Gen.* (1789), 68, Ord. IV.

10 For the history of this question and the affinities formerly ascribed to the Nymphæads see the memoir of A. P. DE CANDOLLE in vol. i. of the *Trans. de la Soc. de Phys. et d'Hist. Nat. de Genève*.

11 MIRB., in *Ann. Mus.*, xvi. t. 29.

12 *Prodr.*, i. 113, Ord. VIII.

13 *Genera* (1836), 898, Ord. CLXXXV.–CLXXXVII.

All these plants have remarkable vegetative organs; all are perennial herbs, whose rootstock creeps in the mud of marshes or river beds; all have alternate leaves, more or less singular in form, sometimes dissected like the aquatic Crowfoots, as in *Cabomba*, in other cases submerged or floating, palmate, sometimes peltate, and more or less concave above, presenting the form of a very shallow cornet in *Nelumbium*. In the *Sarraceneæ*, as mentioned above, this form is exaggerated into a long, narrow cornet, whose apex forms a variably-lobed lid. The histology of the vegetative organs has been most carefully studied by TRÉCUL,[1] in *Nelumbium*, *Nuphar*, *Nymphæa*, and *Victoria*, plants which in this point have often been regarded as more or less comparable with Monocotyledons.[2] "In *Nuphar lutea*," says this botanist, "we find all the characters ascribed to the stem in Monocotyledons. There are no distinct concentric layers, the pith is interposed between the fibrous bundles, without medullary rays, the density of the stem decreases from the circumference to the centre. All this is shown in a transverse section; it is seen that the parenchyma, homogeneous in the centre, grows denser externally. At a certain distance from the periphery are bundles, arranged more or less regularly in a circle. In the centre are found some few scattered bundles in a young stem,[3] the number increases with the size of the rhizome. Outside the circular zone are other thinner bundles going to the leaves. The whole is covered by a layer of epidermic cells." The same general arrangement prevails in *Nymphæaceæ* and *Nelumbeæ*. TRÉCUL concludes from his observations that "the structure of the rhizome in *Nuphar* is altogether that of the Monocotyledons," as regards the longitudinal course of the bundles, which behave as in the Date-palms, and springing from the circum-

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[1] In *Ann. Sc. Nat.*, sér. 3, iv. 288, t. 10–13; *Etud. Anat. et Organogén. sur la* Victoria regia, *et Anat. Comp. du* Nelumbium, *du Nuphar et de la* Victoria (in *Ann. Sc. Nat.*, sér. 4, i. 144, t. 12–14).

[2] See MIRB., in *Ann. Mus.*, xiii. 465.—ENDL. & UNG., *Grundz. d. Bot.*, 92.—DC., in *Mém. Soc. Phys. de Gen.*, i. 2.—HOOK. F. & THOMS., *Fl. Ind.*, i. 236.—VAUP., *Ueb. d. Peripher. Wachst. d. Gefässb.* (1855), 23.—HENFR., in *Phil. Trans.* (1852), 289, tab.; in *Ann. Nat. Hist.*, ser. 2, x. 398.—CASP., in *Flora* (1857), 717; (1859), 118; in *Bot. Zeit.* (1857), 791.—OLIV., *Stem. in Dicot.*, 5.

[3] "At germination the tigellum of *Nelumbium codophyllum* contains not a single central vascular bundle, as in the young stages of *Nuphar* and *Victoria*, but two zones of vascular bundles, one central, one peripheral, above the insertion of the cotyledons" (TRÉC., in *Ann. Sc. Nat.*, sér. 4, i. 149, 169).

ference, rise vertically and follow a more or less oblique course through the stem to reach the leaves. At the same time adventitious roots, "also with the structure and growth of Monocotyledons," appear on the rhizome at the bases of the leaves.[1] Moreover, the parenchyma, both of rhizome and petiole of *Nymphæeæ* and *Nelumbeæ,* is traversed by enormous lacunæ. These contain gas, with whitish masses of irregular mammillated cells projecting inside, and the so-called radiating or stellate cells, with their rays free in the cavity to whose wall their centre is fixed. These have been considered as organs of support for the different parts of the parenchyma;[2] in the leaves the rays extend so far that their points reach the epidermis. Stomates are only to be found in the *Nymphæeæ* on those parts of the foliar epidermis which are in contact with the air—*i.e.*, the upper surface, in the species with floating leaves. The lower surface bears either hairs, or in *Euryale* prickles, the largest of which contain longitudinal fibres and vessels, and end in a pore or osteole, which is probably an organ of absorption.[3] The leaf blade of *Victoria* is also completely traversed by narrow holes termed stomatodes.[4] Several *Nymphæaceæ* also contain laticiferous vessels, tubular, continuous, cylindrical and more or less irregular.[5]

The histological structure of the *Cabombeæ* seems correlated with their habitat. The submerged parts contain no true vessels,[6] but instead of these more or less elongated cells of variable form,[7] constituting a small number of bundles[8] (usually two) in the stem and branches. Outside is seen a parenchymatous tissue, which is here

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1 "Nothing in the roots of a *Nuphar* recals those of a Dicotyledon. They have no distinct bark, any more than the stem, nor anything comparable to medullary rays. Their whole structure is, on the contrary, comparable to that of a Monocotyledonous root" (TRÉC.), in *Ann. Sc. Nat.*, sér. 3, iv. 304.

2 TRÉCUL has studied the development of these cells, which had been described by GUETTARD in 1747, AMICI, RUDOLPH, DE CANDOLLE, MEYEN, MIRBEL (in *Ann. Sc. Nat.*, sér. 3, iv. 314, t. 12, fig. 19, 25). He saw that at their origin they were placed between two neighbouring cells, and formed a triangular cell, with its angles at first obtuse, and then elongated and ramified; smooth at first, the cell was afterwards covered with polyhedral tuberosities. The form varies greatly with the position and the species under observation.

3 The same author shows PLANCHON "overstepped the truth in saying that the weakest no less than the strongest of these prickles contained vessels; they are confined to the strongest."

4 PL., in *Fl. des Serres*, vi. 249.—TRÉC., *loc. cit.*, 158.

5 TRÉC., *loc. cit.*, 159.

6 SCHLEID., in *Wiegm. Arch.*, ix. 230.—LINDL., *Veg. Kingd.*, 412, fig. 289.

7 Sometimes fusiform, sometimes cylindrical and truncate at either end; no spiracle is found.

8 Usually two, as *Brasenia* and *Cabomba;* and these are often but slightly distinct from the

also analogous to that found in submerged stems generally, to whatever group they may belong, presenting numerous cylindrical lacunæ interposed between the lax chlorophyll-containing elements of the parenchyma. The whole is surrounded by an epidermis bearing peculiar hairs.[1] The absence of spiral vessels and tracheæ in the submerged leaves, as well as in the axes, is the most remarkable point of their organization. The scape of *Sarracena* approaches that of *Leontice*, and the *Podophylleæ* in anatomical structure. It contains fibro-vascular bundles[2] near the circumference, scattered through a parenchyma which is the sole constituent of the centre, where it forms a kind of pith.[3] In the rhizome the most central of these bundles form a pretty regular circle, though separated from one another by unequal breadths of cellular tissue.[4]

The general properties[5] of the *Nymphæaceæ* may be shortly summed up: their vegetative organs are demulcent, sedative, and astringent; the quantity of starch deposited in rhizome, albumen, and embryo makes these nutritive and analeptic. *Nelumbo nucifera*[6] is the sacred *Lotus* so often seen figured on Egyptian and Indian monuments. According to the Brahmin mythology Brahma sits thereon, and on its floating leaves Vishnu was borne on the waters at the day our earth was formed. With it the Egyptians adorned the heads of Isis and Osiris. On the fresh waters of the East and Tropical Asia, its elegant floating leaves and magnificent white or pink flowers form a picture often copied by the Indian and Chinese painters, and sung by the poets sacred and profane. The corolla adds to its charming colour a scent of anise and a slight astringency, which render it as precious as the rose. The *Tamarama* of the Hindoos is moreover rich in farinaceous nutriment, a valued

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surrounding tissue, wherefrom they only differ in their more elongated elements.

[1] Conical, ascending, and often applied to the surface, possibly secreting the mucilage with which the stems are covered.

[2] In these the fibres often surround completely the separate vessels, which are collected in the centre; in other cases the fibres are confined to the outside.

[3] Sometimes partially absorbed, making the stem fistular.

[4] The central part occupied by the pith is here considerable, and gorged with starch. The outermost bundles are slender, as compared with the rest; they early turn brown, and contain no tracheæ that can be unrolled.

[5] MÉR. & DEL., *Dict. Mat. Méd.*, iv. 639.—GUIB., *Drog. Simpl.*, ed. 7, iii. 719.—A. RICH., *Elém.*, ed. 4, ii. 422.—ENDL., *Enchirid.*, 462, 464, 465.—LINDL., *Veg. Kingd.*, 411, 412, 414; *Fl. Med.*, 19.—ROSENTH., *Syn. Pl. Diaphor.*, 652, 1142.

[6] See pp. 76, 79, note 2, fig. 74–78.

auxiliary in famine-times. The ancient Egyptians, too, ate these "Egyptian Beans" (*Fèves d'Egypte*[1]); but they were forbidden fruit to the priests and Pythagoreans. And the Chinese and Hindoos of the present day eat the embryo roast or boiled, like the American Indians eat that of *N. lutea.*[2] The starch gorging the young stems shares these nutritive properties and uses in both species. *N. nucifera* is also a drug; its stem has astringent properties. From the petiole and peduncle a viscid milky juice is extracted which is used in vomiting and diarrhœa. Most other Nymphæads contain tannin; and to this it is no doubt that *Brasenia peltata*[3] owes its slightly astringent properties. Its leaves are thought of service in the treatment of dysentery, phthisis, and other pulmonary affections. They are bitter and stomachic; and are sometimes used for food. So are several *Nymphæeæ*, whose seeds and rhizomes contain quantities of starch. This is the case with *Euryale ferox*,[4] the Tien-kien or Ki-teou of the Chinese; its root, stock, and albumen have been eaten from the remotest times, and the plant is still said to be cultivated for this purpose. *E. amazonica*[5] (the *Victoria Regia*), the magnificent queen of the fresh waters of South America, has seeds of similar alimentary value; it is the *Mararu* of the natives. Nor was the value of the Nymphæas of the Nile less noted among the Ancient Egyptians; *N. Lotus* shared the name of water *Lotos*[6] with the *Nelumbo.* The tuberous stock, of the size and form of an egg, with a blackish surface and a yellow sweet flesh, was eaten roasted or boiled, like potatoes nowadays; and a sort of bread was made from the seeds. No doubt the Blue Water-lily of the "Nile"[7] had the same properties; it has a pear-shaped tuberous stock, and beautiful light blue flowers. The Arabs called it *Linoufar* or *Niloufar*, whence is taken the French name *Nénuphar*, applied to our White and Yellow Water-lilies. Their rhizome is gorged with starch. That of the Yellow (*Nuphar luteum*[8]) is large, cylindrical, and whitish, covered with the scars of the adventitious

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1 Κύαμος αἰγύπτιος THEOPHR. (see GUIB., *loc. cit.*, 723).—ROSENTH., *op. cit.*, 654.

2 See p. 89, note 2, figs. 79–81.

3 ENDL., *Enchirid.*, 464.—ROSENTH., *op. cit.*, 654. (See above p. 82, note 3.)

4 See p. 86, 87, note 1, figs. 99, 100.

5 LINDL., *Veg. Kingd.*, 411.—ROSENTH., *op. cit.*, 652.—Water-maize of the Americans (see above, p. 87, note 3, fig. 101).

6 GUIB., *op. cit.*, 721.

7 *Nymphæa cærulea* SAV., *Dec. Egypt.*, iii. 74.—DC., *Prodr.*, n. 2.—VENT., *Malm.*, t. 6.

8 See p. 81, note 5, figs. 87–92.

GENERA.

I. NELUMBEÆ.

1. **Nelumbo** T.—Flowers regular, hermaphrodite; receptacle convex, soon much enlarged into an obconical mass. Sepals 4, 5, inserted on receptacle imbricate. Petals ∞, imbricate, inserted with ∞ stamens on calyx; filaments more or less petaloid; anthers basifixed introrse 2-rimose; connective produced club-shaped beyond anther-cells. Carpels ∞, inserted in alveoli on flat top of receptacle, free; germen 1-locular; dorsum gibbous, glandular; style short with a minutely projecting, capitate, stigmatose apex; ovules 1, 2, descending almost from apex of cell, anatropous; micropyle superior, introrse. Nuts ∞, nearly round, slightly protruding from pits in the hardened receptacle, indehiscent or obscurely dehiscent. Seed pendulous; skin thin; embryo exalbuminous; cotyledons thick, fleshy, covering much developed leafy plumule; radicle superior very short.—Perennial herbs; rhizome thick; leaves alternate, floating, concavely peltate, "stipulate;" flowers axillary solitary pedunculate (*Asia, Australia, Tropical and Subtropical America*). See p. 76.

II. CABOMBEÆ.

2. **Cabomba** AUBL.—Flowers hermaphrodite, small; receptacle shortly conical. Sepals 3, petaloid, imbricate or contorted. Petals 3, alternate. Stamens 3, alternating with petals, or more usually 6, in pairs opposite sepals, free; anthers extrorse, 2-rimose. Carpels 3, opposite petals, or more rarely 2, 4, free; germen 1-locular; style capitate, depressed; apex slender stigmatose; ovules few (usually 3), inserted on the sides, descending anatropous; micropyle superior extrorse. Drupes 1–3; mesocarp thin; putamen thick, rough on surface. Seeds 1–3, descending; albumen double; inferior farinaceous, superior (amniotic) fleshy, embracing short inverted embryo; cotyledons thick; radicle superior, short.—Herbs; stem slender

covered with mucilage; leaves alternate; floating ones peltate; those submerged palmately divided into filiform segments; flowers axillary solitary long-pedunculate (*Tropical and Subtropical America*). See p. 79.

3. **Brasenia** SCHREB.—Flowers almost of *Cabomba;* stamens 12–∞. Carpels 6–∞; ovules of *Cabomba*. Fruit of ∞ drupaceous carpels and seeds of *Cabomba.*—Stem branched, covered with mucilage; leaves all floating peltate entire; inflorescence of *Cabomba* (*America, Tropical Asia, and Subtropical Australia*). See p. 81.

III. NYMPHÆAÆ.

4. **Nuphar** SM.—Flowers regular; receptacle convex. Sepals 5, 6, unequal imbricate. Petals indefinite, unequal imbricate, the inner resembling stamens (staminodes) inserted in a spiral series, together with ∞ hypogynous free stamens; filaments flattened; anthers introrse, 2-rimose. Germen superior; apex tapering into a short style, peltate disk-shaped above; stigmas ∞, linear radiate; cells ∞; ovules ∞; descending, anatropous, inserted on the sides. Fruit ovoid, corticate carpels baccate, separable in decay. Seeds ∞; embryo and albumen double (*Cabomba*); micropyle operculate.—Perennial herbs; rhizome thick, sigillate; leaves alternate floating peltate; flowers axillary, solitary or in pairs; fruit emerged (*The Northern Hemisphere beyond the Tropics*). See p. 81.

5. **Nymphæa** L.—Flowers regular; receptacle concave cupuliform. Calyx 4-leaved, imbricate, inserted with petals and stamens of *Nuphar*, in a spiral series on the receptacle from the base to the apex. Germen sunk in the receptacle, ∞-locular, with a concave, conical, or round process (the apex of receptacle) protruding vertically from the centre; styles free, exserted; apex incurved, free. Ovules ∞ (of *Nuphar*). Berries spongy, surmounted by scars of perianth and stamens, and by the style, pulpy, at length bursting irregularly. Seeds ∞ (of *Nuphar*) immersed in pulp, covered by a sacciform aril; operculum 0.—Herbs, with stem leaves and inflorescence of *Nuphar;* fruit maturing under water (*All tropical regions, especially of Northern Hemisphere*). See p. 83.

XVI. PAPAVERACEÆ.

I. PLATYSTEMON SERIES.

We shall begin this order by the study of the genus *Platystemon* [1] (figs. 108–111), which, by its gynæceum, presents us with a transition between *Ranunculaceæ* and *Papaveraceæ*. The floral receptacle

Platystemon californicus.

FIG 108.
Flower.

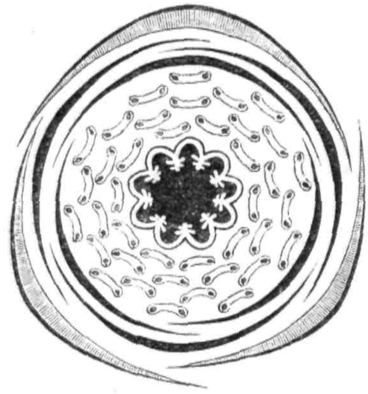

FIG. 109.
Diagram.

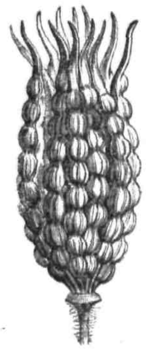

FIG. 111.
Fruit ($\frac{3}{2}$).

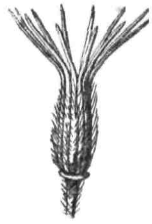

FIG. 110.
Gynæceum ($\frac{2}{1}$).

forms a little platform, slightly depressed and cupuliform at the apex.[2] This part is empty, while on the edges of the cupule are inserted in due order a calyx and two corollas, all trimerous, and an androceum and gynæceum, both formed of an indefinite number of elements. The calyx is regular polysepalous and caducous, of contorted or imbricate præfloration. The petals are similar to one another, twisted or imbricate, sessile; the three outer alternate with the sepals, to which the three inner are superposed. The stamens are arranged in whorls of nine each;[3] they are free, each formed of a

[1] BENTH., in *Trans. Hort. Soc.*, ser. 2, i. 405.—ENDL., *Gen.*, n. 4832.—BENTH., in *Linnæa*, xii. 661.—PAYER, *Organog.*, 217, t. 46.—B. H., *Gen.*, 51, n. 1.

[2] The top of the peduncle is slightly dilated below the insertion of the perianth.

[3] According to PAYER (*loc. cit.*, 220), "these nine stamens make their appearance in two stages; first come six in pairs superposed to the outer petals, and then three each in front of an inner petal." Some of the latter may be deduplicated.

flattened petaloid filament and a basifixed extrorse two-celled anther of longitudinal dehiscence.[1] The gynæceum consists of a whorl of carpels, indefinite in number. The stylar part of each is free, forming a flattened band, with its inner surface and edges covered with stigmatic papillæ; the ovarian division forms a deep gutter, looking inwards, united by its prominent edges to its neighbours to form the projecting placentæ. On both sides of each of these very imperfect septa (which divide only the peripheral part of the cell of the ovary[2]), are seen the ovules, variable in number, ascending and subanatropous, with the raphe upwards and inwards, and the micropyle downwards and outwards.[3] On the outside deep vertical grooves mark the limits of the several carpels. In the dry fruit even the bottom of each groove splits, so that the carpels are isolated (fig. 111), each thus resembling a little follicle, and containing several superposed seeds, between which the pericarp has grown into transverse false-septa. The fruit often breaks up even into one-seeded joints in this way. There is a copious fleshy albumen, near the apex of which is a tiny embryo. *P. californicus*, the only known species,[4] is an annual herb, often cultivated in our gardens. Its parts are milky; it has alternate simple entire exstipulate leaves, which often become nearly opposite or three-whorled towards the top of the stem. The flowers are solitary, terminal,[5] pedunculate.

Platystigma lineare.

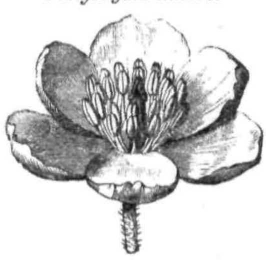

FIG. 112.
Flower ($\frac{2}{1}$).

Platystigma[6] (fig. 112) has the perianth of *Platystemon*, and presents but few points of generic difference. The stamens, indefinite or subdefinite in number,[7] have scarcely dilated filaments, and extrorse

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[1] The connective, at first nearly flat, is later on deformed, so as to be slightly hollow on the outside. The pollen forms elongated grains, with three equidistant longitudinal grooves or folds.

[2] "Each placenta divides into two; each half, on which only one row of ovules developes, inclines towards the neighbouring half of the next placenta, forming with it a sort of chamberlet containing the ovules" (PAYER, *loc. cit.*, 221).

[3] These ovules have two coats. They are usually enclosed in the imperfect canal or chamberlet formed by the concavity of each carpel. But here and there we see one or more, inserted on the innermost edge of the placenta, projecting into the central cavity of the ovary.

[4] LINDL., in *Bot. Reg.*, t. 1679.—*Bot. Mag.*, t. 3579, 3750.—WALP., *Rep.*, i. 117.

[5] The floral peduncle bears three verticillate bracts at a certain distance from the flower. One of these is fertile, and bears in its axil a shoot that pushes the flower on one side; hence this last appears opposite to the fertile bract.

[6] BENTH., in *Trans. Hort. Soc.*, sér. 2, i. 406.—BERNH., in *Linnæa*, xii. 661.—ENDL., *Gen.*, n. 4830.—B. H., *Gen.*, 51, n. 2.

[7] In *Meconella* NUTT. (in *Torr. & Gr. Fl.*

anthers of submarginal dehiscence. The unilocular ovary is surmounted by three or four styles, and contains as many multiovulate, scarcely prominent placentas. The dry fruit opens from above downwards into three or four valves, bearing the seeds on their edges. Of this genus three species are known[1] from North America, all annuals, with habit foliage and inflorescences of *Platystemon*.

Romneya californica[2] approaches the above plants in the freedom of the numerous stigmatiferous tongues surmounting the ovary. Its stamens are very numerous, with filiform filaments and extrorse anthers. The fruit is a prickly capsule, divided inside by the seed-bearing septa into numerous complete or incomplete cells. This species is a branching herb, with pinnatifid leaves and terminal flowers, like those of *Argemone*.

II. POPPY SERIES.

In the Poppies[3] (Fr., *Pavots;* figs. 113–124) the carpels have quite lost their freedom; the flowers are regular and hermaphrodite. The convex receptacle bears a calyx of two[4] opposite, imbricated or twisted, caducous sepals, and two corollas of two petals each, the outer alternate to the sepals, the inner superposed to them; all the petals are twisted or imbricate, corrugated above, in the bud, and caducous.[5] The androceum is represented by an indefinite (usually very large)[6] number of free hypogynous stamens,[7] whose filaments support a basifixed anther, with two lateral cells, each opening by a marginal or subextrorse longitudinal cleft.[8] The

N.-Amer., i. 64), which, through *M. californica* TORR., is inseparable from *Platystigma*.

[1] LINDL., in *Bot. Reg.*, t. 1954.—HOOK., *Icon.*, t. 38, 360 (*Meconella*).—*Bot. Mag.*, t. 3575.—WALP., *Ann.*, i. 23.

[2] HARV., in *Hook. Journ.*, iv. 74, t. 3.—B. H., *Gen.*, 51, n. 3.—WALP., *Rep.*, v. 21.

[3] *Papaver* T., *Inst.*, 237, t. 119, 120.—L., *Gen.*, n. 648.—ADANS., *Fam. des Pl.*, ii. 432.—J., *Gen.*, 236.—GÆRTN., *Fruct.*, i. 288, t. 60.—LAMK., *Dict.*, v. 110; Suppl., iv. 335; *Ill.*, t. 451.—DC., *Syst.*, ii. 69; *Prodr.*, i. 117.—SPACH, *Suit. à Buffon*, vii. 10.—BERNH., in *Linnæa*, viii. 462.—ENDL., *Gen.*, n. 4823.—PAYER, *Organog.*, 218, t. 224.—B. H., *Gen.*, 51, 965, n. 4.—? *Closterandra* BÉL. (ex ENDL., *Gen.*, 856).—? *Arctomecon* TORR., in *Frem. Rep.*, 312, t. 2.—B. H., *Gen.*, 52, n. 58.

[4] Trimerous flowers are of pretty frequent occurrence, especially in cultivation, notably in *P. orientale* L., *bracteatum* LINDL., &c.

[5] Their base is often marked by a dark, blackish spot.

[6] On very poor land the number may be almost definite; we occasionally find Red Poppies with only six or eight.

[7] PAYER (*loc. cit.*, 220) states that they appear in succession from below upwards.

[8] The pollen grains are ovoid, with three equidistant longitudinal folds, which become bands in water, and are usually narrow (H. MOHL, in *Ann. Sc. Nat.*, sér. 2, iii. 326).

gynæceum is separated on a short foot, and the one-celled ovary is surmounted by a very short broad style, dilating rapidly into a

Papaver somniferum (nigrum).

Fig. 113.
Habit ($\frac{1}{3}$).

circular head, hemispherical or forming a very depressed cone,[1] capping the ovary and divided at the edge into as many rounded

[1] Often, though wrongly, described as a stigma.

teeth as there are placentas in the ovary. To each tooth corresponds a groove, radiating to it from the centre of the upper surface, with its lips lined by stigmatic tissue. These lines correspond with the

Papaver somniferum (nigrum).

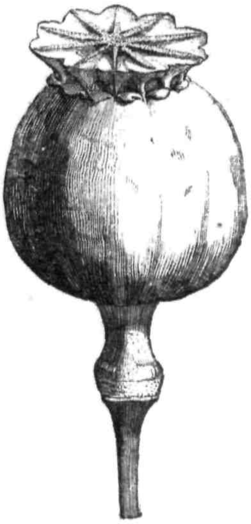

FIG. 114.
Fruit.

FIG. 115.
Seed ($\frac{20}{1}$).

FIG. 116.
Long. sect. of seed.

placentas. The latter, of very inconstant number, project inside the cell to a variable distance (often very slight) from the centre. Hence each forms an incomplete false septum, with both its faces covered wholly or partially[1] with a quantity of little anatropous ovules.[2] The fruit (figs. 114, 118) is dry and capsular; it usually opens[3] near the top, under the base of the style, by the depression of very short valves, corresponding with the spaces between the placentas.[4] Through these false pores escape a large number of little bowed seeds (figs. 115, 116, 122, 123), reticulate or scrobiculate on the surface, and containing in the upper part of the very copious oily fleshy albumen a little straight or bowed embryo.

The little valves of dehiscence do not separate so far from the

[1] In this case the ovules occupy the lower and outer part of the placentas.

[2] They have two coats.

[3] In *P. somniferum*, var. *album* (fig. 118), the lines of dehiscence are marked, but no separation takes place.

[4] After dehiscence the discoid part of the style is supported by as many short columns as there are placentas, separated by the triangular openings through which the seeds pass.

wall of the fruit in those species which have been erected into the genus *Calomecon*,[1] and their flowers are often ternary in our gardens.

Papaver somniferum (album).

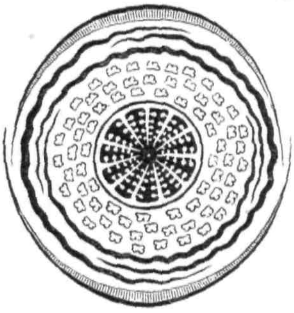

Fig. 117. Diagram.

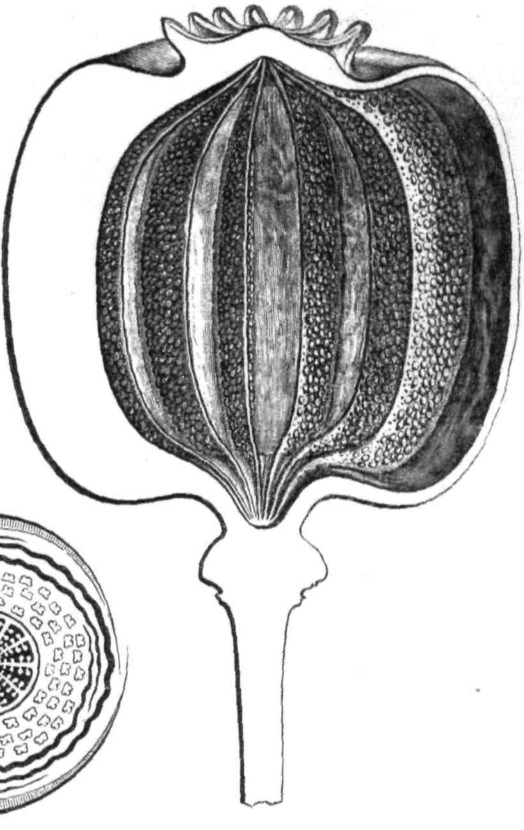

Fig. 118. Long. sect. of fruit.

These, like the rest of the Poppies, are annual or perennial herbs, glaucous and glabrous, or bristling with hairs of varying coarseness, containing white milky juice, possessing alternate exstipulate leaves that are almost always lobed or dissected. The flowers are nearly always solitary, on a long terminal or leaf-opposed peduncle, the top of which droops before the expansion of the flower.[2] There are some fifteen species[3] of this genus, mostly natives of the

[1] SPACH, *Suit. à Buffon*, vii. 7. *P. orientale* and *bracteatum* are our cultivated representatives of this section.

[2] White, yellow, or violet.

[3] JACQ., *Fl. Austr.*, t. 83.— SIBTH., *Fl. Græc.*, t. 419, 492.—LINDL., *Coll.*, t. 23,—

temperate or subtropical regions of Europe, Asia, Africa, and North America. One inhabits South Africa, and another Tropical Australia.

Papaver Rhœas.

FIG. 119.
Flower.

FIG. 121.
Fruit.

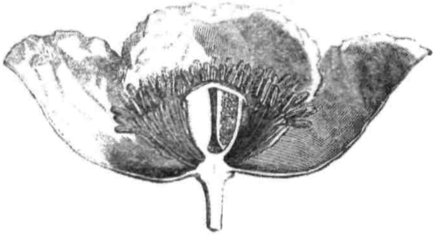

FIG. 120.
Long. sect. of flower.

Close to *Papaver* come the nearly allied genera *Meconopsis*[1] and *Argemone*.[2] The former has a binary flower, with the perianth and androceum of a Poppy. But the number of placentas is variable, from indefinite down to four or five; and they are rib-like or slightly prominent. The style is distinct, and ends in a more or less depressed club, with deflexed radiating lobes superposed to the placenta. The fruit is a narrow elongated capsule, surmounted by the style persisting above the placentas, which are left bare when the walls of the ovary separate in triangular valves from above downwards. The seeds are scrobiculate, naked, or with an arillary outgrowth from the raphe. *Meconopsis* consists of annual or perennial herbs, with a yellow latex, and entire or incised alternate leaves. The flowers are, as in *Papaver*, borne on long drooping peduncles. The flowers[3] are sometimes solitary terminal, sometimes

Papaver Rhœas.

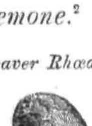

FIG. 122.
Seed ($\frac{12}{1}$).

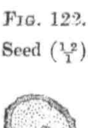

FIG. 123.
Long. sect. of seed.

VIG., *Papav.*, 35, fig. 5–7.—DELESS., *Ic. Sel.*, ii. t. 7.—REICHB., *Icon.*, t. 352, 742–746.—EIKAN, *Tent. Monogr. Gen. Pap.* (1839).—HOOK. F. & THOMS., *Fl. Ind.*, i. 249.—BOISS., *Fl. Or.*, i. 105.—HARV. & SOND., *Fl. Cap.*, i. 15.—OLIV., *Fl. Trop. Afr.*, i. 53.—A. GRAY, *Man.*, 25.—EICHL., in *Mart. Fl. Bras.*, *Papav.*, 315.—BENTH., *Fl. Austral.*, i. 63.—GREN. & GODR., *Fl. de Fr.*, i. 57.—WALP., *Rep.*, i. 110; ii. 750; *Ann.*, i. 23; ii. 26; iv. 172; vii. 83.

[1] VIG., *Papav.*, 20, 48, fig. 3.—DC., *Syst.*, ii. 86; *Prodr.*, i. 117; in *Mém. Soc. Gen.*, i. t. 2, fig. 11.—BERNH., in *Linnæa*, viii. 462.—ENDL. *Gen.*, n. 4822.—B. H., *Gen.*, 52, n. 7.—*Cerastites* GRAY, *Brit. Pl.*, ii. 704 (ex ENDL.).

[2] Perhaps it would be as well to suppress the genus *Meconopsis*.

[3] Yellow, red, or blue, with a more or less poisonous smell.

arranged along a common branch, axillary to its bracts or ill-developed leaves, so as to form a sort of large lax raceme, with the secondary axes drooping before the flowers expand. *M. cambrica*[1] is European; the seven or eight remaining species[2] inhabit the Himalayas and North America.

Papaver hybridum.

FIG. 124.
Inflorescence.

Argemone[3] (figs. 125–127) has usually trimerous flowers, with a calyx,[4] two corollas, and indefinite stamens. It is distinguished from *Papaver* only by slight characters derived from the gynæceum and fruit, especially from the number of constituent carpels, the form and arrangement of the stigmatiferous divisions of the style, and the extent of the triangular valves of dehiscence. The one-celled ovary contains from three to six narrow multi-ovulate parietal placentas, and is surmounted by a short style, which soon expands into as many[5] stigmatiferous lobes, concave above and lined by velvety stigmatiferous tissue. The fruit is an elongated capsule, opening above by the depression of as many valves as there are placentas. These latter remain surmounted by the style to form a sort of cage, between the bars of which the scrobiculate seeds escape. *Argemone* consists of herbs with a yellow latex, possessing alternate incised pinnatifid leaves, often covered with stiff bristles or sharp prickles, like the peduncles, calyx, and ovary. The flowers[6] are terminal. The five or six known species[7] are American; but one of them is now found all over the Tropics.

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[1] VIG., *loc. cit.*—DC., *Fl. Fr.*, v. 586.—GREN. & GODR., *Fl. de Fr.*, i. 60.—*Papaver cambricum* L., *Spec.*, 727.

[2] HOOK. F., *Ill. Pl. Himal.*, t. 8, 9.—*Bot. Mag.*, t. 4668, 5585.—WALP., *Rep.*, i. 110 (part.); *Ann.*, iv. 170; vii. 86.

[3] *Argemone* T., *Inst.*, 239, t. 121.—L., *Gen.*, n. 649.—ADANS., *Fam. des Pl.*, ii. 432.—J., *Gen.*, 236.—GÆRTN., *Fruct.*, i. 287, t. 60.—LAMK., *Dict.*, i. 287; Suppl., i. 447; *Ill.*, t. 452.—DC., *Prodr.*, i. 120.—SPACH, *Suit. à Buffon*, vii. 25.—PAYER, *Organog.*, t. 46.—ENDL., *Gen.*, n. 4821.—B. H., *Gen.*, 52, 965, n. 6.—*Echtrus* LOUR., *Fl. Cochinch.*, 344.

[4] A little below the organic apex of each sepal is an external prominence, a pointed cone of variable length, resulting from a localized development of the midrib (fig. 125).

[5] The stigmatiferous lobes are superposed to the placentas, as in the Poppies.

[6] White or yellow.

[7] HOOK. F. & THOMS., *Fl. Ind.*, i. 255.—BENTH., *Fl. Hongk.*, 15.—A. GRAY, *Gen. Ill.*, t. 47; *Man.*, 25.—CHAPM., *Fl. S. Unit.-States*, 21.—GRISEB., *Fl. Brit. W. Ind.*, 12.—EICHL., in *Mart. Fl. Bras.*, *Papav.*, 315.—OLIV., *Fl. Trop. Afr.*, i. 54.—*Bot. Reg.*, t. 1264.—*Bot. Mag.*, t. 2342.—WALP., *Rep.*, i. 109; *Ann.*, ii. 25; iv. 170; vii. 85.

Cathcartia[1] has the flower of *Argemone*, with a dimerous perianth, and a cylindrical capsular fruit with from four to six valves opening all the way down to leave a sort of cage, of which the bars are formed

Argemone mexicana.

FIG. 125.
Flower-bud.

FIG. 126.
Flower.

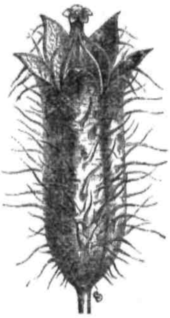

FIG. 127.
Open fruit.

by the hardened placentas surmounted by the persistent style. *C. villosa* is a Himalayan herb, with a yellow juice and the leaves covered with tawny hairs, like those of certain Poppies, of which it has the inflorescence.

Stylophorum[2] has nearly the fruit of *Cathcartia*, with two, three, or four placentas. The ovary is surmounted by an erect style which expands above into a head with erect stigmatiferous lobes separated by deflexed sinuses; in other respects the dimerous flower and vegetative organs are very near those of *Chelidonium*. Four species of this are known,[3] two are perennial herbs from North America; a third[4] is Himalayan; the fourth comes from Eastern Asia and Japan.[5]

Sanguinaria canadensis[6] (figs. 128, 129) is a little perennial herb,

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1 HOOK. F., in *Bot. Mag.*, t. 4536.—B. H., *Gen.*, 52, n. 8.—WALP., *Rep.*, iv. 175.

2 NUTT., *Gen.*, ii. 7.—BERNH., in *Linnæa*, viii. 461.—ENDL., *Gen.*, n. 4820.—A. GRAY, *Gen. Ill.*, t. 48.—B. H., *Gen.*, 52, n. 9.

3 DC., *Prodr.*, i. 121 (*Meconopsis*).—HOOK., in *Bot. Mag.*, t. 4867.—WALP., *Rep.*, i. 110 (*Meconopsis*); *Ann.*, vii. 86.

4 *S. lactucoides*, whereof J. HOOKER & THOMSON (*Fl. Ind.*, i. 255) have made a genus, *Dicranostigma*, because its gynæceum is dicarpellary.

5 *Chelidonium uniflorum* SIEB. & ZUCC. (*Fl. Jap. Fam. Nat.*, i. 63), whereof MAXIMOVITZ (*Prim. Fl. Amur.*, 36, t. 3) makes a genus *Hylomecon*, giving it the specific name *H. vernalis*. It has the fruit of *Chelidonium*, but its style is that of the other species of *Stylophorum*. Perhaps some day we shall be compelled to regard this as only a section of the genus *Chelidonium*.

6 *Sanguinaria* DILL., *Elth.*, t. 252.—L., *Gen.*, n. 645.—J., *Gen.*, 236.—LAMK., *Dict.*, vi. 498; *Ill.*, t. 449.—DC., *Syst.*, ii. 88; *Prodr.*,

whose rhizome produces in spring one or more aerial shoots; each usually consists of a well developed petiolate leaf with a palmiveined

Sanguinaria canadensis (*Puccoon*).

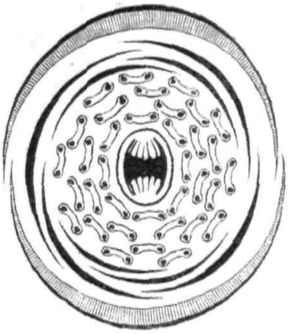

FIG. 129.
Diagram.

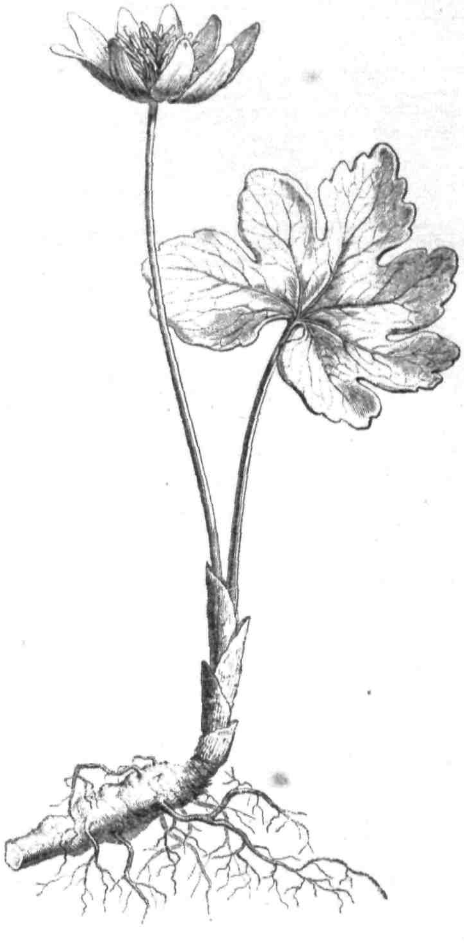

FIG. 128.
Habit.

blade, several other leaves reduced to imbricate scales, and a pedunculate flower, almost ephemeral. This resembles in calyx and andro-

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i. 131.—SPACH, *Suit. à Buffon*, vii. 37.—BERNH., in *Linnæa*, viii. 459.—ENDL., *Gen.*, n. 4818.—A. GRAY, *Gen. Ill.*, t. 49.—B. H., *Gen.*, 53, n. 10.—*Belharnosia* SARRAC., ex ADANS., *Fam. des Pl.*, ii. 432.

ceum that of *Chelidonium* or *Stylophorum*. But there are from eight to twelve petals, each piece of both corollas being replaced by two or three unequal imbricate leaves (fig. 129). The ovary contains two multiovulate parietal placentas,[1] and its style ends in two deflexed adnate stigmatiferous lobes. The fruit dehisces by two valves, which separate all down their edges, leaving the seeds suspended on the placentary frame or replum. These seeds are formed as in the Poppies, but the raphe has an arillary crest as in *Chelidonium*. This species extends over a great part of North America.[2]

Bocconia (Macleya) cordata.

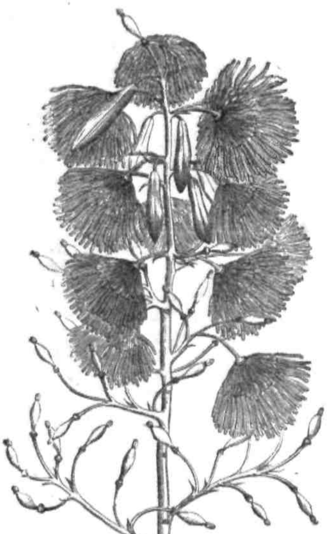

FIG. 130.
Inflorescence.

In the genus *Bocconia*[3] (figs. 130–133) we see a greatly reduced type; its flowers are apetalous[4] and its ovary pauciovulate. In *Macleya*,[5] which cannot be separated from this genus, the two placentas, which stand right and left, bear each several ascending ovules with the micropyle downwards and inwards. But in *Bocconia* proper (figs. 131–133) only one of them bears on its lower part an almost basilar fertile ovule.[6] The stamens are indefinite,[7] or subdefinite in some species.[8] The fruit is like that of *Sanguinaria*, with one

1 The ovules have two coats, and are finally arranged in several rows on each placenta.

2 L., *Spec.*, 723.—A. GRAY, *Man.*, 26.—CHAPM., *Fl. S. Unit.-States*, 22.—*Bot. Mag.*, t. 162.—WALP., *Rep.*, i. 109.

3 PLUM., *Gen.*, 35, t. 25.—ADANS., *Fam. des Pl.*, ii. 431.—L., *Gen.*, n. 591.—J., *Gen.*, 236.—GÆRTN., *Fruct.*, i. 204, t. 44.—LAMK., *Dict.*, i. 432; *Ill.*, t. 394.—DC., *Syst.*, ii. 89; *Prodr.*, i. 121.—BERNH., in *Linnæa*, viii. 460.—SPACH, *Suit. à Buffon*, vii. 40, 42.—ENDL., *Gen.*, n. 4816.—B. H., *Gen.*, 53, n. 11.

4 PAYER has seen that the two imbricate or twisted sepals (fig. 132) "appear almost simultaneously, and are lateral" (*Organog.*, 218, t. 48).

5 R. BR., in *App. Denh. & Clapp.*, 218.—ENDL., *Gen.*, n. 4817.

6 The raphe at first looks towards the placenta; later on it gets twisted, so that the raphe looks to one and the inferior micropyle to the other interstice between the placentas.

7 In *Macleya cordata* R. BR. (*Bocconia cordata* W.) the androceum usually comprises four whorls of six stamens each (PAYER, *loc. cit.*, 219, t. 48).

8 "The androceum of *B. frutescens* usually consists of but six stamens, that make their appearance at two successive periods" (PAYER, *loc. cit.*). In the specimens from the Antilles the stamens are often more numerous.

or few seeds possessing an arillary outgrowth above the base. *Bocconia* consists of perennial herbs or shrubs, with a yellow or red juice. The leaves are alternate, lobed; the small flowers form terminal compound racemes.[1] Of the three known species one inhabits China and Japan,[2] and the others are spread over great part of Tropical America.[3]

Bocconia frutescens.

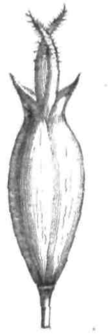

FIG. 131.
Flower ($\frac{3}{1}$).

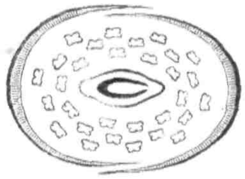

FIG. 132.
Diagram.

FIG. 133.
Long. sect. of gynæceum.

Celandine[4] (Fr., *Chélidoine,* figs. 134–136) has the perianth and androceum of the Poppies,[5] two caducous sepals, four caducous similar petals, and an indefinite number of free hypogynous stamens with introrse two-celled anthers of longitudinal dehiscence. But the gynæceum is reduced to two alternisepalous carpellary leaves. The elongated one-celled ovary ends in a short thick style, which divides above into two short deflexed stigmatiferous lobes superposed to the placentas.[6] These last are superposed to the sepals, linear, bearing an indefinite number of anatropous ascending ovules,

[1] "They are racemes of flowers again grouped into a raceme along a common axis. I may add that in each of the smaller racemes (Fr., *Grappe*) the chief axis of the inflorescence ends in a flower which expands before the rest" (PAYER, *loc. cit.*, 218).

[2] *B. cordata.* Several forms from Japan are now cultivated, especially *Macleya iedoensis* SIEB. & ZUCC. (WALP., *Rep.*, i. 109; *Ann.*, vii. 87).

[3] H. B. K., *Nov. Gen. et Spec.*, i. 119, t. 35.—*Bot. Mag.*, t. 1905.

[4] *Chelidonium* T., *Inst.*, 231, t. 116.—L., *Gen.*, n. 647.—ADANS., *Fam. des Pl.*, ii. 432.—J., *Gen.*, 236.—GÆRTN., *Fruct.*, ii. 164, t. 115.—LAMK., *Dict.*, i. 73; Suppl., i. 208; *Ill.*, t. 450.—DC., *Syst.*, ii. 98; *Prodr.*, i. 122.—SPACH, *Suit. à Buffon*, vii. 34.—ENDL., *Gen.*, n. 4819.—PAYER, *Organog.*, 217, t. 45.—B. H., *Gen.*, 53, n. 14.

[5] The pollen is like that of *Papaver.*

[6] The two lobes being the prominent papillose portions, while the alternating deflexed rounded prominences represent the summits of the carpels.

with their micropyles downward and inwards. The fruit is dry, narrow, and elongate; in short, it is formed like a siliqua, recalling in externals that of many Crucifers, but lacking the false septum; when mature the two valves separate from the placenta, which, surmounted by the style, forms a narrow elongated frame, supporting the ascending seeds. These (figs. 135–136) have the micropyle inferior and contain copious fleshy albumen around the minute embryo, while the raphe is dilated towards its centre into a little arcuate arillar crest.[1] *Chelidonium* comprises erect branching herbs, with coloured latex. The leaves are dissected, their lobes varying greatly in size with the form or variety. The flowers form an umbelliform cyme on top of a common terminal peduncle.[2] Though botanists have admitted several species in this genus it probably contains only one,[3] which has been observed in Europe, Temperate Asia, and North America.

Chelidonium majus (*Common Celandine*).

FIG. 134.
Floriferous branch.

FIG. 135.
Seed ($\frac{8}{1}$).

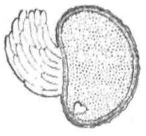

FIG. 136.
Long. sect. of seed.

We find the fundamental organization of the Celandine in the Horn-Poppies[4] (Fr., *Glaucières, Pavots cornus*; fig. 137). But the stigmatiferous lobes of the style are more marked, and persist, extending into a four-lobed cupule above the apex of the seed. The fruit is itself very long, cylindrical, more or less bowed. Inside it

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[1] The cells of the surface are here hypertrophied, thus forming an aril of the raphe, which has often been termed a strophiole.

[2] Sometimes leaf-opposed, owing to the rapid development of the axillary branch.

[3] *C. majus* MILL., *Dict.*, n. 1.—L., *Spec.*, 723.—REICHB., *Ic. Fl. Germ.*, iii. t. 10.—GREN. & GODR., *Fl. de Fr.*, i. 62.—*C. laciniatum* MILL., *Dict.*, n. 2.—*C. quercifolium* WILLEM., *Fl. Lorr.*, ii. 613.

[4] *Glaucium* T., *Inst.*, 254, t. 130.—L., *Gen.*, n. 236.—ADANS., *Fam. des Pl.*, ii. 432.—J., *Gen.*, 236.—GÆRTN., *Fruct.*, ii. 165, t. 115.—LAMK., *Dict.*, Suppl., ii. 209, 789.—DC., *Syst.*, ii. 94; *Prodr.*, i. 122.—BERNH., in *Linnæa*, viii. 463.—SPACH, *Suit. à Buffon*, vii. 30.—ENDL., *Gen.*, n. 4826.—PAYER, *Organog.*, t. 47.—B. H., *Gen.*, 53, n. 12.

project the two placentas covered with seeds and united by a thick hard false septum, which is nearly cylindrical, with the seeds more or less completely embedded in it. On dehiscence they remain in this central column, while the two carpellary leaves diverge from it from above downwards almost to the base of the fruit. The seeds are scrobiculate but not arillate.

Glaucium flavum.

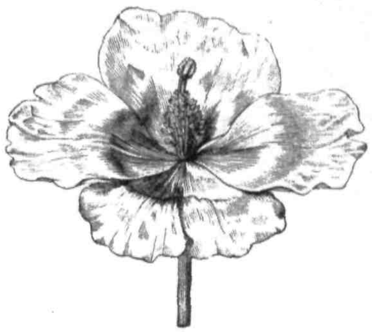

FIG. 137.
Flower.

Glaucium consists of herbs with a coloured juice, and lobed or dissected alternate leaves. The flowers are in terminal cymes, sometimes reduced to a single flower. Five or six species have been distinguished[1] from the Mediterranean, one inhabits the seacoasts of Europe, Asia, and North Africa.

Rœmeria[2] has the perianth and androceum of *Glaucium* or *Papaver*, so that the flower is externally quite that of the latter. But its slender elongated ovary, with from two to four linear placentas, is surmounted by a sessile slightly dilated stigma with deflexed. adnate lobes. The seeds attached to the edges of long narrow concave valves are quite those of a Poppy ; there is no false septum. One or two species of this genus are known,[3] herbs from Temperate Europe and Asia, with the habit and inflorescence of *Papaver*.

III. ESCHSCHOLTZIA SERIES.

Eschscholtzia[4] (figs. 138–141) has regular hermaphrodite flowers. The receptacle forms a hollow cone, whose mouth is surrounded by

[1] SM., *Exot. Bot.*, ii. t. 7.—SIBTH., *Fl. Græc.*, t. 488, 489.—FRES., in *Mus. Senkenb.*, i. t. 10.—REICHB., *Ic. Fl. Germ.*, iii. t. 11, 12.—A. GRAY, *Man.*, 26.—BOISS., *Fl. Or.*, i. 119.—GREN. & GODR., *Fl. de Fr.*, i. 61.—WALP., i. 115; ii. 750; *Ann.*, i. 23; iv. 174; vii. 86.

[2] MEDIK., in *Uster. Ann.*, iii. *Rep.* (1792), 15.—DC., *Syst.*, ii. 92; *Prodr.*, i. 122.—ENDL., *Gen.*, n. 4825.—B. H., *Gen.*, 53, n. 13.

[3] DC., in *Mém. Soc. Gen.*, i. 224, t. 2.—DELESS., *Ic. Sel.*, ii. t. 8.—SIBTH., *Fl. Græc.*, t. 490 (*Glaucium*).—BOISS., *Fl. Or.*, i. 118.—WALP., *Ann.*, i. 23; iv. 174.

[4] CHAM., in *Nees Hor. Phys. Berol.*, 73, t. 15.—DC., *Prodr.*, iii. 344.—SPACH, *Suit. à Buffon*, vii. 47.—BERNH., in *Linnæa*, viii. 464.—ENDL., *Gen.*, n. 4827.—PAYER, *Organog.*, 217, t. 45.—B. H., *Gen.*, 54, n. 17.—*Chryseis* LINDL., in *Bot. Reg.*, t. 1948.

a discoid rim more or less prominent externally,[1] and bears a calyx and tetramerous corolla, perigynous like the indefinite stamens; while the gynæceum is inserted down in the bottom. The two valvate sepals cohere completely, and come off together at the base by a circular slit, like an extinguisher. The petals are sessile and caducous, imbricate or twisted. The stamens, also inserted on the

Eschscholtzia crocea.

FIG. 139.
Gynæceum ($\frac{4}{1}$).

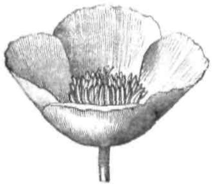

FIG. 138.
Flower ($\frac{2}{3}$).

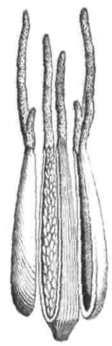

FIG. 140.
Gynæceum opened.

edge of the receptacle,[2] consist each of a free filament and a basifixed introrse two-celled anther of longitudinal dehiscence. The ovary is free and one-celled, with two multiovulate parietal placentas;[3] the terminal style ends in four, six, or eight branches, whereof two are the continuations of the placentas,[4] all covered with stigmatiferous papillæ at the apex. The fruit is a narrow elongated dry capsule, traversed by ten longitudinal ribs, and dehiscing down to the base into two rigid recurved valves which bear the seeds on their edges. The albumen is copious around a small embryo. *Eschscholtzia* consists of four or five species[5] of glabrous glaucescent herbs from North

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[1] The development of this prominence is late; it can only be compared to the usually more internal disks, which are due to hypertrophy of the receptacle.

[2] PAYER says (*loc. cit.*, 219) they are "grouped in alternating whorls of six; in each whorl the stamens appear at two successive times. . . . . Moreover . . . . the four first stamens of the first whorl are in pairs superposed to the two outer petals."

[3] When adult the ovules are arranged transversely or obliquely, in several rows.

[4] As may be seen in figs. 139, 140, especially in the latter, where the two carpellary leaves, separated from the placentas, themselves end each in two or three stigmatiferous processes (PAYER, *Organog.*, 221). Hence we may say that two of the divisions of the style are simple and placentary (as in *Cruciferæ*), while the others, simple or lobed, represent the apex of the carpellary leaves (as in *Chelidonium*).

[5] *Bot. Mag.*, t. 2887, 3495, 4812.—*Bot. Reg.*, t. 1168, 1677.—WALP., *Rep.*, i. 116; *Ann.*, iv 175; vii. 87.

America. They have alternate exstipulate leaves with linear lobes. Their flowers are solitary on long terminal or leaf-opposed peduncles. In the flowers of *E. tenuifolia*,[1] cultivated in our gardens, the receptacle forms a sac without any external prominent rim. This cannot, however, be separated generically from *Eschscholtzia*, any more than the so-called *Hunnemannia*[2] *fumariæfolia* (fig. 141), a Mexican plant which has been made the type of a distinct genus because its sepals separate instead of remaining united edge to edge; we hence consider it a distinct section of the genus *Eschscholtzia*.[3]

Eschscholtzia (Hunnemannia) fumariæfolia.

FIG. 141. Flower.

Dendromecon rigidum[4] has the flowers of a *Hunnemannia*, with a style dividing above into two short thick erect stigmatiferous lobes, alternate with the placentas. Its fruit is, moreover, nearly that of an *Eschscholtzia*, narrow and elongated, dehiscing into two long recurved valves that bear the seeds on their edges. But its vegetative organs are very different; it is a shrub (from California) with alternate simple entire rigid reticulate leaves,[5] and solitary terminal flower.[6]

IV. FUMITORY SERIES.

The only reason that Fumitory (Fr., *Fumeterre*, figs. 142, 159–165) should give its name to this series is that it is the most common and the longest known type; but it is, as we shall see later, an irregular and reduced one. In fact, it is not easy to understand its organization, till after the study of some other genera of the

[1] BENTH., in *Trans. Hort. Soc.*, ser. 2, i. 408.

[2] SWEET, *Brit. Fl. Gard.*, iii. t. 276.—HOOK., in *Bot. Mag.*, t. 3061.—ENDL., *Gen.*, n. 4828.—B. H., *Gen.*, 54, n. 16.

[3] The ovary bears ten longitudinal ribs, three corresponding with each carpellary leaf, and two with each placenta. The stigmatiferous lobes are shorter than in *Eschscholtzia*. There are often six of them, two placentary, four carpellary. The dehiscence of the anthers is nearly marginal. The pollen is orange-coloured.

[4] BENTH., in *Trans. Hort. Soc.*, ser. 2, i. 407.—B. H., *Gen.*, 54, n. 15.—HOOK., *Icon.*, t. 37; in *Bot. Mag.*, t. 5134.

[5] Subsessile, elliptical, or lanceolate, penniveined, with a network of anastomosing ribs.

[6] With a yellow delicate corolla, opening in sunshine, and closing in the shade, as in *Eschscholtzia*.

same group, such as *Hypecoum*[1] or *Dicentra*. The former (figs. 143–150) has regular hermaphrodite flowers. On the little convex

Fumaria officinalis.

FIG. 142.
Habit.

eceptacle are borne two antero-posterior sepals, two alternating

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[1] T., *Inst.*, 230, t. 115 (*Hypecoon*).—L., *Gen.*, n. 171.—J., *Gen.*, 236.—GÆRTN., *Fruct.*, 164, t. 115.—LAMK., *Dict.*, iii. 160; Suppl., 82; *Ill.*, t. 88.—DC., *Syst.*, ii. 101; *Prodr.*, 23.—BERNH., in *Linnæa*, viii. 465.—SPACH, *Suit. à Buffon*, vii. 62.—ENDL., *Gen.*, n. 4833.—PAYER, *Organog.*, 227; *Fam. Nat.*, 128.—B. H., *Gen.*, 54, 965, n. 18.—*Mnemosilla* FORSK., *Fl. Ægypt.-Arab.*, 122.

petals, and two more superposed to the sepals, all four usually trilobate.[1] The androceum consists of four stamens superposed two to the outer and two to the inner petals.[2] Each has a free filament and an

Hypecoum procumbens.

FIG. 143.
Flower ($\frac{3}{1}$).

FIG. 145.
Flower unexpanded.

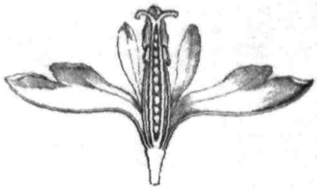

FIG. 144.
Long. sect. of flower.

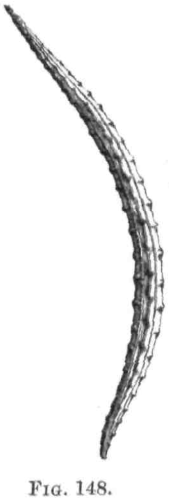

FIG. 148.
Fruit.

FIG. 147.
Sexual organs ($\frac{4}{1}$).

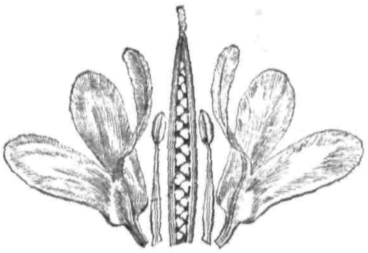

FIG. 146.
Flower dissected.

FIG. 150.
Seed ($\frac{6}{1}$).

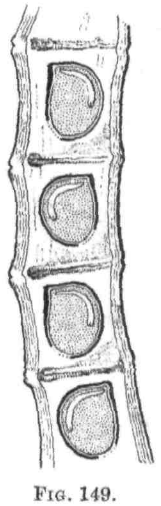

FIG. 149.
Long. sect. of part of the fruit ($\frac{5}{1}$).

introrse two-celled anther of longitudinal dehiscence. The free gynæceum consists of an elongated one-celled ovary, surmounted by a style with two stigmatiferous branches, superposed to the outer petals. The placentas, alternating with these, are parietal, each

[1] In this case the three lobes are imbricated, as though they were three distinct petals.

[2] For they are arranged according to the law of alternation, in two dimerous verticils, as in *Epimedium*.

same group, such as *Hypecoum*[1] or *Dicentra*. The
143–150) has regular hermaphrodite flowers. On t
by transverse fals
dividing into one-seeded segmen
dehiscing by two longitudinal valves.[1] The ascending
a large albumen, lodging on one side some way from its c
a narrow bowed excentric embryo. The four or five know
of this genus are glaucous glabrous annual herbs, with
multisect leaves of linear segments. They become smaller a
opposite below the flowers, which are terminal or leaf-opp
sometimes collected into a sort of leafy raceme, on a peculi
with no leaves towards its base. All these plants are natives
Mediterranean regions of Europe and Africa, or of Temperate

Our knowledge of the floral organization of *Hypecoum*, makes t
of *Dicentra*[3] (figs. 151–153) now easy. Both of the oppositisepalo
stamens are completely deduplicated; each lateral half, consisting
a slender filament and an anther-cell, quits its fellow to adhere to the edge of the alternisepalous stamen. Hence this appears formed, above a certain height, of one broad flattened filament bearing at the top four anther-cells, of which the two central alone belong to one single stamen. Such is the origin of the apparent diadelphy that groups the stamens in two bundles superposed to the outer petals (fig. 151). These have above their base a sac-like or spur-like dilatation, while the inner pair (fig. 153) are narrower and unguiculate, and cohere by their tips which bear an external keel or wing. The ovary is surmounted by a style with a two- or four-lobed lip,[4] and contains a large number of ovules[5] on two antero-posterior parietal placentas. The

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[1] On this character is founded the genus *Chiazospermum* BERNH. (in *Linnæa*, viii. 465), whose type is *H. erectum* L. (*Spec.*, 181), a Daourian species, which can only be made a distinct section of *Hypecoum*.

[2] SIBTH., *Fl. Græc.*, ii. 47, t. 156.—REICHB., *Ic. Fl. Germ.*, iii. t. 9.—BOISS., *Fl. Or.*, i. 124.—GREN. & GODR., *Fl. de Fr.*, i. 62.—WALP., *Rep.*, i. 117; *Ann.*, i. 23; iv. 176; vii. 88.

[3] BORKH., ex BERNH., in *Linnæa*, viii. 468.—ENDL., *Gen.*, n. 4836.—B. H., *Gen.*, 55, n. 20.—*Diclytra* DC., *Syst.*, ii. 107; *Prodr.*, i. 125.—PAYER, *Organog.*, 227, t. 50; *Fam. Nat.*, 127. (The name has often been wrongly written *Dielytra*.) — *Macrocapnos* ROYLE, in *Lindl. Introd.*, ed. 2, 439.—*Dactylicapnos* WALL., *Tent. Fl. Nepal.*, 51, t. 39.—BERNH., in *Linnæa*, viii. 467.—ENDL., *Gen.*, n. 4835.—*Capnorchis* PL., in *Fl. des Serr.*, viii. 193.—*Eucapnos* SIEB. & ZUCC., in *Abh. Ak. Mün.*, iii. 721, t. 1, fig. 2.

[4] In the latter case we must distinguish between the two primitive lobes corresponding with the apices of the carpellary leaves and the unequally flattened and expanded lobes with incised edges, which vary in form with the species, and are situated lower down, owing to a late hypertrophy of the sides of the style.

[5] They are originally ascending, with the micropyle downwards and inwards; they have two coats.

fruit is dry, flattened so that the placentas are brought close against one another; it dehisces longitudinally by the separation of the placentas from the valves, which either leave them entirely or remain clinging to one. The seeds, naked or with an arillary crest, are formed as in *Corydalis*. About twelve species[1] of *Dicentra* are known, half American, half from Temperate Central and Eastern Asia. They are perennials, often climbing; the leaves are alternate multisect; the flowers are collected into terminal or leaf-opposed simple racemes or racemes of cymes.

Dicentra spectabilis.

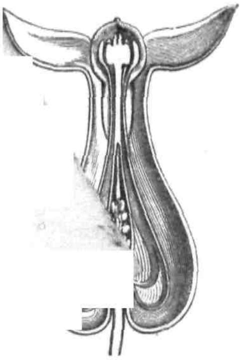

FIG. 152.
Long. sect. of flower.

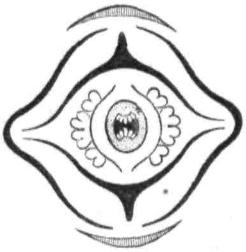

FIG. 151.
Diagram.

FIG. 153.
Inner petal.

Adlumia cirrhosa,[2] a climber from North America, is a *Dicentra* with conferruminate petals; it is in no other respect different.

Corydalis[3] (figs. 154–158) may be defined as *Dicentra* with only one petal prolonged above its base into a spur, sac, or gibbosity.

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[1] DELESS., *Ic. Sel.*, ii. t. 9 B.—A. GRAY, *Gen. Ill.*, t. 50; *Man.*, 27.—CHAPM., *Fl. S. Unit.-States*, 22.—DON, in *Sw. Brit. Fl. Gard.*, ser. 2, ii. t. 127.—*Bot. Mag.*, t. 3031, 4458.—WALP., *Rep.* i., 118; *Ann.*, i. 24; iv. 177; vii. 89.

[2] RAFIN., in *N.-York Med. Repos.*, ii. hex. 5, 350; in *Desvx. Journ. Bot.*, ii. 169.—DC., *Syst.*, ii. 111; *Prodr.*, i. 126.—BERNH., in *Linnæa*, viii. 468.—ENDL., *Gen.*, n. 4837.—A. GRAY, *Gen. Ill.*, t. 151; *Man.*, 27.—CHAPM., *Fl. S. Unit.-States*, 22.—B. H., *Gen.*, 55, n. 21.—*Bicuculla* BORKH., in *Rœm. Arch.*, i. 2, 46.—*Corydalis fungosa* VENT., *Ch. de Pl.*, t. 19 (ex ENDL.).

[3] DC., *Syst.*, ii. 113; *Prodr.*, i. 126.—SPACH, *Suit. à Buffon*, vii. 71–84.—ENDL., *Gen.*, n. 4839.—B. H., *Gen.*, 55, n. 22.—*Capnoides* BOERH., *Lugd.-Bat.*, 391.—GÆRTN., *Fruct.*, ii. 163, t. 115.—T., *Inst.*, 423, t. 237.—ADANS., *Fam. des Pl.*, ii. 431.—*Cysticapnos* BOERH., *loc. cit.*—ENDL., *Gen.*, n. 4842.—*Neckeria* SCOP., *Introd.*, n. 1436.—*Bulbocapnos* BERNH., in *Linnæa*, viii. 469.—*Phacocapnos* BERNH., *loc. cit.*, 664.—*Sophorocapnos* TURCZ., in *Bull. Mosc.* (1848), i. 570.—*Cryptoceras* SCHOTT (ex WALP., *Ann.*, iv. 570).—*Ceratocapnos* DUR., in *Parlat. Giorn. Bot.*, i. 336.

Hence the flower is made irregular by the unilateral projection.[1] The ovary contains one or more ovules,[2] and the one- or many-

Corydalis bulbosa.

FIG. 154.
Inflorescence.

FIG. 155.
Flower ($\frac{2}{1}$).

FIG. 156.
Flower dissected.

seeded fruit opens as in *Dicentra*. The seeds have an arillary crest.[3] Some seventy species[4] of this genus have been described, erect or

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[1] When, as occasionally happens, the opposite flower assumes a similar form, the flower becomes accidentally regular, like that of a *Dicentra*. This we have found the case in whole inflorescences of *C. cava*. [See GODR., *Mém. sur les Fumariacées à Fleurs Irrégulières et sur les Causes de leur Irrégularité*, in *Ann. Sc. Nat.*, sér. 5, ii. 272. See also, on the androceum of *Fumariaceæ*, CARUEL, in *Bull. Soc. Bot. de F.*, xiv. 228; and on the general symmetry of the flowers in this group, EICHL., in *Flora* (1865), 433, 449, 497, 513, 529, 545, in *Mart. Fl. Bras.*, *Papav.*, 323, t. 68;—BUCHEN., in *Flora* (1866), 39.]—PAYER (*Organog.*, 227, t. 49, 50) has also studied the symmetry of the parts by following up their development.

[2] They have two coats.

[3] Resulting from the excessive development of a little group of cells near the base of the raphe, on the opposite side of the hilum to the micropyle; it has often been termed a strophiole. In this genus the seeds have often an enormous albumen at the time the fruit dehisces, without any embryo. This developes ulteriorly in certain species, just as in *Eranthis*.

[4] DELESS., *Icon. Sel.*, ii. t. 9, 10.—REICHB., *Ic. Fl. Germ.*, iii. 5–8.—WIGHT, *Ill.*, 11.—HARV. & SOND., *Fl. Cap.*, i. 16.—BOISS., *Fl. Or.*, i. 126.—MAXIM., *Prim. Fl. Amur.*, 37.—A. GRAY, *Gen. Ill.*, t. 52; *Man.*, 27.—CHAPM., *Fl. S. Unit.-States*, 23.—GREN. & GODR., *Fl. de Fr.*, i. 64.—WALP., *Rep.*, i. 118; ii. 750; v. 23; *Ann.*, i. 24; ii. 27, 29 (*Ceratocapnos*); iv. 184, 190 (*Cryptoceras*); vii. 89.

climbing herbs. When they are perennial the subterranean part is often a tuberous rhizome of variable form (157, 158), the evolution of which presents numerous specific peculiarities.[1] The leaves are alternate or subopposite, multisect exstipulate. The flowers form terminal or leaf-opposed, simple or more rarely ramified racemes. *Corydalis* inhabits Europe, Temperate Asia, North and South Africa, and Temperate America.

Corydalis solida.

FIG. 157. Long. sect. of young bulb.

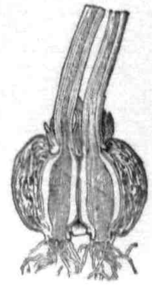

FIG. 158. Long sect. of older bulbs.

Sarcocapnos[2] has altogether the flower of *Corydalis;* but the number of ovules on each of the two placentas is small[3] or often reduced to one only. The fruit is a little, flattened, one- or two-seeded, indehiscent achene. Three or four species[4] of this genus are known, low herbs, from the Mediterranean, Spain, and North-western Africa. Their leaves are dissected as in *Corydalis,* with usually larger fleshier segments. The flowers form terminal paucifloral racemes.

The Fumitories[5] (figs. 142, 159–165) offer a reduced type of *Corydalis* and *Sarcocapnos.* They have the same flower in perianth[6] and androceum,[7] and the indehiscent fruit of *Sarcocapnos.* But the ovary

[1] BISCH., in *Zeitschr. f. Phys.*, iv. 146; in *Ann. Sc. Nat.*, sér. 2, i. 117.—MARLY, in *Flora* (1838), 728.—E. DE BERG, in *Ann. Sc. Nat.*, sér. 2, xiii. 158.—MICHAL., in *Bull. Soc. Bot. de Fr.*, vi. 779, 804; vii. 596.—GERM., in *Bull. Soc. Bot. de Fr.*, vii. 590, 594.

[2] DC., *Syst.*, ii. 129; *Prodr.*, i. 129.—ENDL., *Gen.*, n. 4841.—B. H., *Gen.*, 56, n. 23.—*Aplectrocapnos* BOISS., *Diagn.*, v. 79.

[3] I have often seen two ovules on one placenta, and only one on the other.

[4] LAMK., *Ill.*, t. 597, fig. 4 (*Fumaria*).—DESF., *Fl. Atl.*, t. 173 (*Fumaria*).—BERNH., in *Linnæa*, viii. 470.—WALP., *Rep.*, v. 24.

[5] *Fumaria* T., *Inst.*, 422, t. 237.—L., *Gen.*, n. 849.—ADANS., *Fam. des Pl.*, ii. 431.—J., *Gen.*, 237.—GÆRTN., *Fruct.*, ii. 162, t. 115.—LAMK., *Dict.*, ii. 566; Suppl., ii. 681; *Ill*, t. 115.—DC., *Syst.*, ii. 129; *Prodr.*, i. 129.—SPACH, *Suit. à Buffon*, vii. 85.—ENDL., *Gen.*, n. 4843.—PAYER, *Organogén.*, 227, t. 49.—B. H., *Gen.*, 56, 965, n. 24.—HAMMAR, *Monogr. Gen. Fumar.*, in *Nov. Act. Soc. Reg. Upsal.*, ser. 3, ii. p. i. 257, t. 1–6.—*Platycapnos* BERNH., in *Linnæa*, viii. 471.—ENDL., *Gen.*, n. 4844.—*Discocapnos* CHAM. & SCHLTL., in *Linnæa*, i. 569.—BERNH., in *Linnæa*, viii. 470.—ENDL., *Gen.*, n. 4840.

[6] Flowers occur, which become regular (like those in figs. 162, 163), because neither petal is

FIG. 162.

FIG. 163.

spurred. The petals, when affected by this monstrosity, are usually somewhat greenish, tapering at the base, and almost spathulate.

[7] As in *Corydalis*, it sends down a glandular

at maturity contains only one subbasilar ascending ovule with its micropyle downwards and outwards, inserted on the lower part of one of the two parietal placentas. The other placenta remains sterile.[1] The fruit is a little drupe, whose skin finally dries up; the

Fumaria officinalis.

FIG. 164. Fruit ($\frac{8}{1}$).

FIG. 159. Flower ($\frac{5}{1}$).

FIG. 161. Flower, perianth removed.

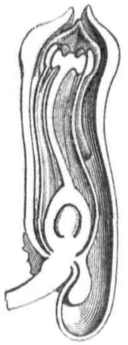

FIG. 160. Long. sect. of flower.

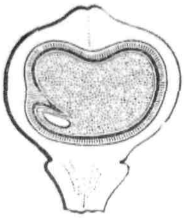

FIG. 165. Long. sect. of fruit.

stone contains a single seed. The Fumitories are glaucous herbs, often annual, erect and much branched, or climbing. In leaves and inflorescence they resemble *Corydalis*. Half a dozen species are known,[2] inhabitants of Europe, Asia, North and South Africa, Australia, and North and South America.

The *Papaveraceæ* were made a distinct class, even in the list of

decurrent spear into the hollow of the gibbous petal, like that of the androceum of the Violet. The form of the pollen grains is very remarkable both in *Fumaria* and *Corydalis* (see H. MOHL, in *Ann. Sc. Nat.*, ser. 2, iii. 326); it is polyhedral, or else spherical, with very large prominent papillæ that make it look polyhedral. Thus in *Fumaria officinalis* and *Alexandrina*, and *Corydalis capreolata*, they form viscid opaque spheres, with six or twelve regularly arranged papillæ. In *F. nobilis* they bear three narrow bands. In *C. lutea* and *sempervirens* they are divided by narrow bands, "like a cube, triangular prism, or tetradon;" in *F. spicata*, "like a pentagonal dodecahedron." The grains of *F. officinalis* have the general form of a cube with the angles rounded off. If one of the faces is presented to the observer four large papillæ are seen, forming a sort of hemispherical cap to each angle, with a sort of ring round the base. Nearer the centre of the face, and within these papillæ, are seen not more than four similar ones.

[1] Or if at first it bears a few ovules, their development is soon arrested, like those on the fertile placenta that do not reach maturity.

[2] REICHB., *Ic. Fl. Germ.*, iii. t. 1–4.—BOISS., *Fl. Or.*, i. 132.—HARV. & SOND., *Fl. Cap.*, i. 18.—HARV., *Thes. Cap.*, t. 10 (*Discocapnos*).—A. GRAY, *Man.*, 23.—EICHL., in *Mart. Fl. Bras.*, *Papav.*, 319.—C. GAY, *Fl. Chil.*, i. 103.—OLIV., *Fl. Trop. Afr.*, i. 55.—GREN. & GODR., *Fl. de Fr.*, i. 66.—WALP., *Rep.*, v. 23 (*Discocapnos*); *Ann.*, ii. 27; iv. 178; vii. 92.

B. DE JUSSIEU[1] in 1759. Besides the seven genera *Bocconia, Sanguinaria, Chelidonium, Argemone, Papaver, Hypecoum,* and *Fumaria,* it contained *Podophyllum, Nymphæa, Sarracena, Monotropa,* and *Impatiens.* In 1763 ADANSON[2] included the same genera in his family *Pavots* (Poppies), together with the then known *Berberidaceæ,* the *Actæeæ,* and *Laurus;* but he excluded *Monotropa.* A. L. DE JUSSIEU[3] retained only the first seven of the above genera and added *Glaucium;* relegating *Monotropa* to the "*genera incertæ sedis,*" and *Podophyllum* and *Actæa* to *Ranunculaceæ. Papaveraceæ* was then reduced to eight genera, six with indefinite and two (*Hypecoum* and *Fumaria*) with definite stamens. DE CANDOLLE, between 1822 and 1824,[4] made *Papaveraceæ* and *Fumariaceæ* into two distinct orders. The former included all A. L. DE JUSSIEU's order, except *Fumaria,* besides *Rœmeria* of MEDICUS[5] and *Meconopsis* of VIGUIER;[6] the latter comprised *Fumaria, Adlumia* of RAFINESQUE,[7] and *Diclytra*[8] and *Corydalis.*[9] When ENDLICHER[10] drew up his "*Genera Plantarum*" some fifteen years later, the order *Papaveraceæ,* including *Fumariaceæ* as a suborder, comprised seven more genera: *Macleya* of R. BROWN,[11] *Stylophorum* of NUTTALL,[12] *Eschscholtzia* of CHAMISSO,[13] *Dendromecon Platystemon* and *Platystigma* of BENTHAM,[14] and *Sarcocapnos* of DE CANDOLLE.[15] To these types have since been added *Romneya* by HARVEY[16] in 1845, and *Càthcartia* by J. HOOKER[17] in 1851; besides two other doubtful genera, one[18] imperfectly described, the other[19] of uncertain position, which raise the tale of Papaveraceous genera to twenty-three, comprising some hundred and sixty species.

These plants are very unequally distributed over the globe. The

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[1] In *A. L. de Juss. Gen.*, lxvii.

[2] *Fam. des Pl.*, ii. 425, Fam. LIII.

[3] *Gen. Plant.* (1789), 235, Ord. II.

[4] *Syst.*, ii. 67, 105; *Prodr.*, i. 117, 125, Ord. IX., X.

[5] In *Uster. Ann.*, iii. (1792).

[6] *Hist. Nat. Med. et Econ. des Pavots et des Argémones*, Montpell., 1814.

[7] In *N.-York Med. Repos.*, ii. 350; in *Desvx. Journ. Bot.*, ii. (1809).

[8] DC., *Syst.*, ii. (1822).

[9] DC., *Fl. Fr.*, iv. (1805).

[10] *Gen.* (1836–1840), 854–861.

[11] In *Denh. & Clapp. App.* (1826).

[12] *Gen.*, ii. (1818).

[13] In *Nees Hor. Phys. Berol.* (1820).

[14] In *Trans. Hort. Soc.*, ser. 2, i. (1835).

[15] *Syst.*, ii. (1822).

[16] In *Hook. Journ.*, iv.

[17] In *Bot. Mag.*, t. 4596.

[18] *Pteridophyllum* SIEB. & ZUCC. (in *Abh. Ak. Mün.*, iii. 719, t. 1, f. 1;—B. H., *Gen.*, 54, n. 19;—WALP., *Rep.*, v. 21). "Sepals 2, scale-like. Petals 4, 2 outer elliptical-concave, 2 inner, flat. Stamens 4, opposite petals. Placenta of ovary nerve-like, bearing at very base 1, 2 ovules; style filiform; stigmatiferous lobes spreading, alternating with placentæ.—A herb; rhizome rather thick; leaves radical, pectinate-pinnatisect; scapes naked, ending in a simple or sub-racemose raceme.—Species 1, Japanese: *P. racemosum* SIEB. & ZUCC." (This ill-known plant seems very near to *Dicentra*).

[19] *Tovaria* RUIZ & PAV., which has been

two series whereof *Platystemon* and *Eschscholtzia* are the respective types, comprising five genera and fifteen species, are confined to the West of North America. Of the ten genera composing *Papavereæ* only four extend to America: *Papaver*, whereof most species are confined to the Old World; *Argemone*, with all its species American; two species of *Stylophorum*, and the single one of *Chelidonium*, are also represented there. In *Fumarieæ*, *Fumaria* and *Corydalis* are divided between both Worlds, though very unequally, America possessing only one species out of six of the former genus, and four out of upwards of sixty of the latter. Of the twelve species of *Dicentra* half are found in each hemisphere. The monotypical genera *Adlumia* and *Tovaria* are exclusively American, and *Hypecoum*, *Sarcocapnos*, and *Pteridophyllum* are natives of the Old World only. The last is limited to Japan. *Adlumia* and *Sanguinaria*, both monotypical, are confined to North America. The only known *Cathcartia* is a Himalayan plant. European representatives occur to the following genera: *Papaver*, *Meconopsis*, *Glaucium*, *Rœmeria*, *Chelidonium*, *Hypecoum*, *Corydalis*, *Sarcocapnos* and *Fumaria*, including more than one-third of the total number.

Botanists of the present day are agreed in dividing *Papaveraceæ* into four tribes or series:

I. PLATYSTEMONEÆ.—Petals all similar, stamens free indefinite. Stigmatiferous divisions of the style alternate with the placentas, free, distinct, often diverging. Gynæceum showing externally a

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usually classed as an abnormal genus of *Phytolaccaceæ*, but EICHLER proposes to place it in *Papaveraceæ*, as linking this with the former order. *T. pendula*, the only known species is a native of Peru, Colombia, the Antilles, &c. On its convex floral receptacle we find eight imbricated caducous sepals; eight alternating imbricated sessile petals; from eight to twelve free hypogynous stamens, with introrse two-celled anthers of longitudinal dehiscence; a shortly stipitate gynæceum, whose 6–8-celled ovary is surmounted by a short style, which rapidly dilates into a head with from 6 to 8 thick stumpy rays, stigmatiferous on the upper side. Each cell contains in its ventral angle a thick placenta, whose two lobes bear numerous anatropous ovules. The fruit is a globular berry, with a thin pericarp; it contains in its pulp an indefinite number of seeds, inclosing a fleshy albumen and a bowed embryo. *T. pendula* is an annual herb of very strong smell, with an erect glabrous branching stem. Its leaves are alternate exstipulate, trifoliolate, membranous. Its flowers form slender drooping multifloral terminal racemes. (R. & PAV., *Prodr.*, 49, t. 8; *Fl. Per.*, iii. 73, t. 309.—PAV., in *Act. Med. Matrit.*, i. 192.—DON, in *Edinb. N. Phil. Journ.*, vi. 50.—ENDL., *Gen.*, n. 5006.—HOOK., *Icon.*, t. 664.—GRISEB., *Fl. Brit. W. Ind.*, i. 17.—MACF., *Fl. Jam.*, 112 (*Bancroftia*).—PL., in *Voy. Lind.*, 20.—TRIANA & PL., in *Ann. Sc. Nat.*, sér. 4, xvii. 88.—B. H., *Gen.*, 110, 969, n. 23.—EICHL., in *Mart. Fl. Bras.*, *Cappar.*, 239.)

trace of the separation of the ovaries of the several carpels, which becomes complete at maturity; seminiferous placentas then remaining attached to the valves of the fruit.—(3 genera.)

II. Papavereæ.—Corolla and androceum as in *Platystemoneæ*. Style thick, dilated into a sort of more or less stumpy head (often wrongly described as a stigma), incised at the edges into lobes or crenulations which alternate with the placentas, or else bear each a stigmatiferous line or groove superposed to a placenta. Fruits capsular, usually opening by valves alternate with the placentas, which are here left free and support the style.

III. Eschscholtzieæ.—Corolla and androceum perigynous, otherwise as in the preceding series. Gynæceum partially inferior, dicarpellary. Stigmatiferous divisions four at least, respectively corresponding with the two placentas and the entire or divided summits of the carpellary leaves. Fruit elongate, longitudinally striate; valves placentiferous on the edges.—(2 genera.)

IV. Fumarieæ.—Flowers dimerous, with two dissimilar corollas. Stamens definite (4–6). Gynæceum dicarpellary.—(7 genera.)

By each one of these series the order *Papaveraceæ* is linked to some special order among its allies; by *Platystemonæ* to *Ranunculaceæ*, by *Papavereæ* to *Ranunculaceæ* and *Berberidaceæ*, by *Eschscholtzieæ* and *Fumarieæ* to *Cruciferæ* and *Capparidaceæ*. Thus *Platystemon*, wherewith we commenced the study of this order, has sometimes been referred to *Ranunculaceæ*. For if the gynæceal elements be united by the ovarian portion into a single one-celled ovary, yet at maturity each carpellary leaf becomes free, so that the arrangement recalls that of a Ranunculad. Moreover, orders closely allied to *Ranunculaceæ* and *Papaveraceæ* may contain side by side with their polycarpic types, other genera with a one-celled ovary and parietal placentæ; thus, in *Anonaceæ*, *Magnoliaceæ*, and *Berberidaceæ* we find such genera as *Monodora*, *Canella*, *Erythrospermum*. Hence the close affinities between *Ranunculaceæ* and *Papaveraceæ* cannot be ignored, and the latter may be termed the unilocular type of the former. But there are other characters that prevent our fusing the two orders into one; the frequency of dimerous symmetry of the floral whorls, the presence of latex of peculiar properties in the organs, and the almost constantly capsular fruit of the *Papaveraceæ*. *Podophylleæ* form another link between these two orders, and

have sometimes been ascribed to *Ranunculaceæ*. But at the same time it has been found impossible to ignore the close affinities between *Sanguinaria* and *Jeffersonia*, which only really differs in its unicarpellary gynæceum. Hence the other *Berberidaceæ*, too, border closely on *Papaveraceæ*. True they lack milky juice and possess a peculiar colouring matter instead. Their anthers often open by valves, though sometimes by longitudinal clefts. But we have shown that in the latter case the anthers are really introrse, despite contrary appearances, while those of *Papaveraceæ* are generally extrorse. It is useless to turn to the number of carpels, usually single in *Berberidaceæ* but numerous in *Papaveraceæ*, since the *Lardizabaleæ*, all pluricarpellary, have been placed among the former, together with *Erythrospermeæ*, whose carpels are united into a one-celled ovary, quite like that of a Poppy. But there is one other difference between *Papaveraceæ* and *Berberidaceæ* (including *Podophylleæ*). The number of stamens, when definite, is a multiple of two in the former; while in the latter it is a multiple of three, the androceum, consisting of deduplicated trimerous verticils. *Epimedium*, whose species have nearly all dimerous flowers, offers the only exception, and here the valvate anthers are characteristic.[1] By the *Fumarieæ*, with the androceum definite, the *Papaveraceæ* no doubt approach the hexandrous *Cruciferæ*; but the stamens are not tetradynamous; and even when, as in *Glaucium*, the fruit is a siliqua with a false dissepiment, the seeds have a fleshy albumen which is absent in Crucifers.[2] The Poppies come especially close to *Nymphæaceæ* and *Sarraceneæ*. But the latter group have as many petals as sepals; not as in *Papaveraceæ*, a calyx and two corollas, whatever may be the sum total of the perianth leaves; and the *Nymphæeæ* have indefinite petals arranged along a continuous spiral instead of in whorls; while their seed has a double albumen. We find too among the orders with a

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[1] J. G. AGARDH (*Theor. Syst.*, 72, t. 5, figs. 6, 7) compares *Papaveraceæ* chiefly with *Nandineæ*, which he separates from *Lardizabaleæ* and *Berberidaceæ*: "*Papaveraceæ* sunt *Nandineæ* carpellis pluribus, in pistillum unicum conjunctis."

[2] "Gemmulæ in *Papaveraceis* ita positæ sunt ut raphe latus superum gemmulæ horizontalis aut erectiusculæ servet, micropyle infera deorsa. Gemmulas contra in *Cruciferis* epitropas video, quod, structura seminum quoque comparata, typum omnino diversum mihi indicat." (AG., *loc. cit.*, 73.) B. MIRBEL (in *Ann. Sc. Nat.*, sér. 1, vi. 266, t. 11) long ago established the chief points of difference between *Papaveraceæ* and *Cruciferæ*; and when we study the floral symmetry of the latter order, we shall see in what respects many botanists have found it comparable with the former.

one-celled ovary and parietal placentation whose affinities with the *Polycarpicæ* are not yet clearly settled, certain genera that recall *Papaveraceæ* by their sexual organs; such as *Parnassia* and several *Cistaceæ*, *Bixaceæ*,[1] and *Capparidaceæ*.

The vegetative organs of *Papaveraceæ* are to some extent characteristic. We may note the usually herbaceous stems, often glabrous and glaucous, or covered with long hairs, which may be harsh and prickly. Only in two, *Bocconia* and *Dendromecon*, does the frutescent stem become woody, at least in its lower part. A far more marked character of organization is the presence of a white or coloured milky juice in most *Papaveraceæ*. In some it becomes opalescent and translucent, and in *Fumarieæ* almost exclusively the juice is quite or nearly transparent in stem and leaves. The *Papaveraceæ* have always been cited as typically rich in proper juice or latex.

The laticiferous vessels of *Papaveraceæ*, formerly imperfectly described,[2] have been recently studied by TRÉCUL.[3] He finds two types of structure and distribution of these vessels in *Papaveraceæ*. "In the one type they are chiefly allotted to the circumference of the fibrovascular bundles of the aerial stems and leaves (*Chelidonium*, *Macleya*, *Sanguinaria*, &c.). In the other they are only present in the subliberian tissue of the fibrovascular bundles of these same organs; hence in neither case is it the liber fibres alone that contain the latex; which, however, does not imply that the laticifers have none of the characters of these fibres. The *Papaveraceæ* . . . . on the contrary, will serve to show that these vessels are formed of elements that vary with the parts they traverse—*i.e.*, in the parenchyma they are formed from cells like those of the parenchyma; in contact with the liber they may be formed of cells like those of the liber, and susceptible of similar thickening, &c." In *Papaver*, *Argemone*, and *Rœmeria* the laticifers are seen in the sub-

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[1] Especially *Cochlospermeæ*, made a tribe of this order, but sometimes possessing the habit of *Papaveraceæ*. *Cochlospermum* has, it is true, pentamerous flowers, but the structure of its gynæceum recalls that of a Poppy, and its latex is yellow, as in *Rœmeria*, *Argemone*, &c.

[2] By MOLDENHAUER, who in 1812 (*Beitr. z. Anat. d. Pflanz.*, 141), described those of *Chelidonium*, and since by UNGER, HANSTEIN, &c., who have recognised the arrangement in rows of the laticiferous cells. (See also AMICI, in *Ann. Sc. Nat.*, sér. 1, i. 224, t. 13.—LINK, *Icon. Anat.*, fasc. 2, xiv. 8.—C. H. SCHULTZ, in *Nov. Act. Nat. Cur.*, xviii. Suppl. ii. t. 16, 17.)

[3] In *Compt. Rend.*, lx. 522; in *Adansonia*, vii. 145; in *Ann. Sc. Nat.*, sér. 5, v. 44.—This work it is that we summarize here, and to it we refer the reader for the numerous details of the question.

liberian tissue forming long continuous tubes, anastomosing more or less frequently, according to the species—very rarely in *Papaver somniferum*.[1] In the calyx and fruit they form, on the contrary, a very intricate network. In the root of *Argemone* we see the rows of laticiferous cells which are destined to be transformed into anastomosing tubes. This condition, rows of cells forming a network with other rows, is permanent in *Sanguinaria Canadensis*, where we also find isolated latex cells, and in the petals continuous tubes. The laticiferous cells of *Chelidonium* vary in form, according to the part they occupy. In the cortical parenchyma and medullary rays they are short. In the liber they are elongated like the fibres thereof. In *Bocconia* (*Macleya*) *cordata* their distribution is nearly the same.[2] The reservoirs of latex found in the liber appear to be true liber fibres, and differ in no respect from the rest of them when the contained latex has disappeared with age; this occurs gradually, from below upwards.[3] In *Glaucium* the latex is in isolated cells which in the stem are early emptied.[4] Some rows of cells with yellow latex are found in the outermost layers of the root. In the various plants of this order the reservoirs of latex communicate either with one another by perforations or special canals,[5] or with the various lymphatic vessels; and even in *Argemone*, TRÉCUL has seen the formation of latex *in situ* in the cavity of certain vessels, and stopping up their channels.[6]

The plants of this order owe their most marked qualities to the presence of these juices;[7] where the latex is abundant we find poisonous, narcotic, acrid, irritant, or evacuant properties usually very marked. The Poppies are essentially opium plants, and this terrible poison or heroic remedy, is an integral part of the latex, or rather is only the thickened latex, deprived by desiccation of the greater part of its water. This juice is found in most parts of the plant, fruit, calyx, leaves,

[1] Far more frequently in the Red Poppy.

[2] There are cells with yellow orange or red latex, "scattered through the bark and medullary rays, and between the vessels of the wood."

[3] At a certain age it is confined to the pericarp.

[4] Only a little brown granular matter is left in the cells round their walls.

[5] In *Argemone* bays form in the neighbouring sides of two parallel vessels, and advancing to meet, often touch by their summits, and then blend by the absorption of their walls at the point of contact.

[6] At first these form yellow protuberances on the inner wall of the vessel, limited by a very delicate membrane, which then meet in the centre of the channel, and sometimes fuse.

[7] DC., *Ess. sur les Propr.*, 107.—GUIB., *Drog. Simpl.*, ed. 6, iii. 695.—A. RICH., *Elém.*, ed. 4, ii. 407.—ENDL., *Enchirid.*, 444.—LINDL., *Veg. Kingd.*, 431; *Fl. Hort.*, 15.—PEREIRA,

branches, stem, and root. From these organs bruised the ancients obtained the narcotic extract, which they called *meconium*. It is by incision into the green fruit, some days after flowering, that opium is obtained. The process varies in Persia, Asia Minor, Egypt, India, and even those European countries where native opium manufacture has been attempted. But opium invariably consists, when it has undergone no further manipulation, of little coherent pale or tawny transparent masses, which are only agglomerations of more or less desiccated drops of latex. We need hardly mention that opium is the sedative and narcotic *par excellence* and that its properties are found in the numerous compounds into which it enters,[1] and in several of the numerous alkaloids it contains,[2] whose study is so interesting from the point of view of chemical theory as well as of medical science. The true Opium-Poppy is the white-seeded variety of *Papaver somniferum*[3] (figs. 117, 118), though the other varieties contain opium which might be utilized.[4]

P. bracteatum,[5] *orientale*,[6] *Rhœas*,[7] *dubium*,[8] *hybridum*,[9] *Argemone*,[10] and *nudicaule*,[11] all appear to owe their properties to the presence of a little morphia in their organs. It is also found in some allied genera, *Argemone* in particular.[12] In many other Papaverads the latex is acrid and irritant, often very poisonous. That of the Greater Celandine[13] (Fr., *Grande Éclaire*; figs. 134–136), which is orange-

Elem. Mat. Med., ed. 4, ii. p. ii. 586.—ROSENTH., *Synops. Pl. Diaphor.*, 623.

[1] Such as thebaic extract, Laudanum (of SYDENHAM & ROUSSEAU), Mithridate, Theriacum, Dover's Powder, *Masse de Cynoglosse*, *sirop diacode*, succinum or *karabé*, Paregoric Elixir, Tincture of Opium, Black Drop, &c.

[2] Especially Morphia ($C_{17}H_{19}NO_3$), Narcotine ($C_{2?}H_{23}NO_7$), Codeine ($C_{18}H_{21}NO_{31}H_{20}$), Narcein ($C_{23}H_{29}NO_9$), Papaverine ($C_{20}H_{21}NO_4$), Narcogenine ($C_{18}H_{19}NO_5$), Thebaïne ($C_{19}H_{21}NO_3$), Porphyroxine, &c.

[3] L., *Spec.*, 726.—LAMK., *Ill.*, t. 451.—DC., *Syst.*, ii. 81; *Prodr.*, i. 120, n. 21.—*P. officinale* NEES & EBERM., *Handb.*, iii. 446. MATTHIESSEN, *on Narcotine*, in *Phil. Trans.*, 1863, 1869, 1870; MATTHIESSEN & WRIGHT, *on the Opium Bases*, *in Proc. Roy. Soc.*, xvii. 455, 460; xviii. 83, 122.

[4] *P. somniferum β*, *album* DC., *Prodr.*, ii. 120.—*P. album* J. BAUH., *Hist Pl. Univ.*, iii. 390.—GUIB., *op. cit.*, 698.—*P. album sativum* LOBEL, *Icon.*, 272.—*P. album hortense, semine albo, sativum Dioscoridis, album Plinio* C. BAUH, *Pin.*, 170.— Ἥμερος, DIOSC.

[5] LINDL., *Coll.*, t. 23.—KER, in *Bot. Reg.*, t. 658.—DC., *Prodr.*, n. 18 —GUIB., *op. cit.*, 705.

[6] L., *Spec.*, 727.—CURT., in *Bot. Mag.*, t. 57.—DC., *Prodr.*, n. 17.—GUIB., *op. cit.*, 704.

[7] L., *Spec.*, 726.—SM., *Engl. Bot.*, t. 645.—DC., *Prodr.*, n. 9.—LINDL., *op cit.*, 15.—GUIB., *op. cit.*, 704.—PEREIRA, *op. cit.*, 586. The petals, which contain rhœadine, are especially used as a sedative (HESS., in *N. Rep. Pharm.*, xv. 139).

[8] L., *Spec.*, 726.—SM., *Engl. Bot.*, t. 644.—SCHKUHR., *Handb.*, ii. 69, t. 140.—DC., *Prodr.*, n. 7.

[9] L., *Spec.*, 725.—DC., *Prodr.*, n. 5.

[10] L., *Spec.*, 725.—DC., *Prodr.*, n. 6.

[11] L., *Spec.*, 725.—SIMS, in *Bot. Mag.*, t. 1633.—DC., *Prodr.*, n. 1.—*P. radicatum* ROTTB.

[12] In *A. mexicana* L. (*Spec.*, 727;—LAMK., *Ill.*, t. 452;—CURT., in *Bot. Mag.*, t. 243;—DC., *Prodr.*, i. 120;—GUIB., *op. cit.*, 698;—LINDL., *Fl. Med.*, 16;—H. BN., in *Dict. Encycl. des Sc. Méd.*, vi. 56), morphia is found (CHARBON., *Thès. Ec. Pharm. Par.*, 1868).

[13] *Chelidonium majus* MILL., *Dict*, n. 1.—L., *Spec.*, 723.—DC., *Prodr.*, i. 123, n. 1.—GUIB., *op. cit.*, 6J7, fig. 761.—LINDL., *op. cit.*, 17 (see

yellow, is still used in the country for destroying warts, and has been thought of service in obliterating spots upon the cornea; its acridity is very marked. Its reputed efficacy in jaundice is probably only due to its colour. That of the Horn-Poppy[1] (fig. 137) is less acrid; it smells like that of the Poppies. It is said to be sometimes used to adulterate opium; it is still applied to ulcers in horned cattle in the country. *Bocconia*[2] has also an irritant caustic volatile yellow juice of strong odour; it is used in the Antilles like a decoction of the root, as a vermifuge and purgative. The yellow juice of the Mexican *Argemone* is applied to warts, chancres, and ulcerations of the conjunctiva in the United States; and decoctions and infusions of its stem and root are prescribed as counter irritants in certain inflammatory affections of the skin and bladder. The Puccoon or Bloodroot[3] (figs. 128, 129) is gorged with a reddish juice, of burning acrid taste, staining the saliva. Its rhizomes possess very irritant properties.[4] Several species of *Meconopsis*, especially *M. nepalensis*,[5] have also a poisonous latex. The oil obtained from the seeds (chiefly from the albumen) of the *Papaveraceæ* is often very acrid. Thus the seeds of *Argemona mexicana* are purgative, and said to be as active as those of *Crotum Tiglium*. In India they are also used as an emetic. The acridity disappears entirely in the oil of *Glaucium flavum*,[6] and it has been proposed[7] to grow the plant for this. Many of the Poppies might no doubt be used to supply an oil like that obtained in Europe from the seeds of *Papaver somniferum* var. *nigrum*[8] (figs. 114–116),

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above, p. 116, note 3, figs. 134–136). It contains chelidonine, chelerythrine, and chelidonic acid (LIEB., *Chim. Org.*, ii. 603; iii. 503).

[1] *Glaucium flavum* CR., *Fl. Austr.*, ii. 141.—DC., *Prodr.*, i. 122, n. 1.—GUIB., *op. cit.*, 697.—*Chelidonium Glaucium* L., *Spec.*, 724.

[2] Especially *Bocconia frutescens* L. (*Spec.*, 634;—LAMK., *Ill.*, t. 394;—DC., *Prodr.*, i. 121, n. 1;—H. BN., in *Dict. Encycl. des Sc. Méd.*, x. 8;—see above, p. 115, note 3.)

[3] *Sanguinaria canadensis* L., *Spec.*, 723 (see above, p. 112, 114, note 2, figs. 128, 129).—GUIB., *op. cit.*, 695.—LINDL., *Fl. Med.*, 16.—PEREIRA, *loc. cit.*, 666.—ROSENTH., *op. cit.*, 623.

[4] They contain the alkaloid sanguinarine, perhaps identical with chelerythrine (LIEB., *Chim. Org.*, iii. 503). The root acts as a powerful emetic and very energetic acro-narcotic; small doses are said to be tonic and stimulant. The juice is escharotic, and has been applied to tumours and polypi. It is prescribed externally in cases of pneumonia, croup, hydrothorax, typhoid fever, &c. (BIGEL., *Med. Bot.*, i. t. 7.—BENTL., in *Pharm. Journ.*, iv. 263).

[5] DC., *Prodr.*, i. 121, n. 4.—ROSENTH., *op. cit.*, 625.—*Papaver paniculatum* DON. *M. Wallichii* HOOK., from the Himalayas, has the same properties.

[6] See p. 117, note 1.

[7] CLOEZ, in *Ann. Chim. et Phys.*, sér. 3, lix. 129.

[8] DC., *Prodr.*, i. 120, n. 21, *a.*—*P. nigrum* LOB., *loc. cit.*—GUIB., *op. cit.*, 702.—*P. nigrum, sativum* DOD., *Pempt.*, 445.—*P. hortense nigro semine, sylvestre Dioscoridis, nigrum Plinio* C. BAUH., *Pin.*, 170.

which is generally cultivated for this purpose in France under the name of *Œillette* or *Olivette*.

The *Fumarieæ* generally are said to possess very different properties[1] from those of *Papaveraceæ* proper. They are inodorous, slightly bitter, often depurative, sudorific, and aperient. However, *Hypecoum*, intermediate in organization, also shares in the properties of both groups. The juice of *H. procumbens* L. (figs. 143–150), *littoralis* WULF., and *pendula* L., is said to be narcotic and to contain opium. The Fumitories are constantly prescribed as bitter stomachic depuratives, especially *Fumaria officinalis*[2] (figs. 142, 159–165), which enters into the *vinum antiscorbuticum*; next come *F. media*,[3] *spicata*,[4] *Vaillantii*,[5] *capreolata*,[6] *parviflora*,[7] *flabellata* GASP., *macrocarpa* PARL., &c. All these species are considered antiscrofulous, antiherpetic, and antiscorbutic. *Corydalis* has the same properties; and so *C. Glauca*[8] in the United States, and *C. capnoides*[9] in the Mediterranean, are used for the same purposes. Moreover, the swollen stock of some species becomes a reservoir of juices containing the peculiar alkaloid, corydaline. The properties of these tubercles are nearly the same as in those of certain *Aristolochias*; they are somewhat aromatic, sometimes very bitter, astringent and more or less acrid, hence emmenagogue, and recommended as anthelmintic. This applies to those of *C. tuberosa*,[10] *bulbosa* (figs. 157, 158),[11] *fabacea*,[12] and *digitata*.[13] *Dicentra formosa*,[14] so closely allied to *Corydalis*, has also a stock containing starch in spring, and corydaline and an acrid resin. It is prescribed in the United States for herpes, syphilis, and scrofula. Several pretty *Fumarieæ*

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1 GUIB., *op. cit.*, 692.—ENDL., *Enchirid.*, 446.—LINDL., *Veg. Kingd.*, 436; *Fl. Med.*, 17.—ROSENTH., *op. cit.*, 627.

2 L., *Spec.*, 984.—DC., *Prodr.*, i. 130, n. 6.—GUIB., *loc. cit.*, 693, fig. 760.

3 LOIS., *Not.*, 101.—DC., *Prodr.*, n. 5.

4 L., *Spec.*, 985.—DC., *Prodr.*, n. 1.—*Platycapnos spicatus* BERNH., in *Linnæa*, viii. 471.

5 LOIS., *Not.*, 102.—DC., *Prodr.*, n. 8.

6 L., *Spec.*, 985.—DC., *Prodr.*, n. 4.

7 LAMK., *Dict.*, ii. 567.—DC., *Prodr.*, n. 7.

8 PURSH, *Fl. Bor.-Amer.*, ii. 463.—*Fumaria glauca* CURT., in *Bot. Mag.*, t. 179.—*Capnoides glauca* MICHX. (*Herba Capnoides* off.)

9 PERS., *Syn.*, ii. 270.—*Fumaria acaulis* WULF., in *Jacq. Coll.*, ii. 203; *Ic. Rar.*, iii. t. 544. (*Herba Split* s. *Fumariæ luteæ* off.)

10 DC., *Fl. Fr.*, iv. 637; *Prodr.*, n. 8.—GUIB., *op. cit.*, 695.—*Fumaria cava* MILL., *Dict.*, n. 7.

11 DC., *Fl. Fr.*, iv. 637; *Prodr.*, n. 11. (*Radix Aristolochiæ cavæ* off.)

12 PERS., *Syn.*, ii. 269.—DC., *Prodr.*, n. 9.—*Fumaria fabacea* RETZ., *Prodr.*, ed. 2, n. 859 (part.).—*Bulbocapnos fabacea* BERNH. (*Radix Aristolochiæ fabaceæ* off.)

13 PERS., *Syn.*, ii. 270.—*Fumaria Halleri* W.—*Bulbocapnos digitatus* BERNH.

14 BORKH., *loc. cit.*—BENTL., in *Pharm. Journ.*, ser. 2, iv. 353.—GUIB., *op. cit.*, 694.—*Fumaria formosa* ANDR., in *Bot. Repos.*, t. 493.—SIMS, in *Bot. Mag.*, t. 1335.—*Diclytra formosa* DC., *Syst.*, ii. 109.—*Corydalis formosa* PURSH, *loc. cit.*—ROSENTH., *op. cit.*, 628.

are cultivated for ornaments : some species of *Corydalis*, *Dicentra formosa* and *spectabilis*, and *Adlumia cirrhosa* with its delicate climbing stems. In the other series, gardeners prize the various species of *Eschscholtzia*, *Platystemon*, and *Platystigma*, the white and yellow flowered *Argemones*, the *Bocconias* of the section *Macleya*, the Indian species of *Meconopsis*, especially the blue ones, and numberless Poppies, such as *P. orientale* and *bracteatum*, and the handsome, numerous varieties and double forms of *P. somniferum* and *persicum*.

GENERA.

I. PLATYSTEMONEÆ.

1. **Platystemon** Benth.—Flowers 3-merous; receptacle conoidal with summit depressed. Sepals free, imbricate or contorted, deciduous. Corolla double; petals of each of same shape, imbricate or contorted, deciduous. Stamens ∞, hypogynous; filaments compressed; anthers basifixed, extrorse 2-rimose. Carpels ∞, united at first into sulcate germen, projecting a little inwards into ∞-ovulate parietal placentas; styles distinct, stigmatose within; mature carpels distinct linear closed torulose, transversely septate within between seeds, separating into indehiscent, 1-seeded joints. Seeds albuminous.—An annual herb; leaves alternate simple; flowers usually opposite or 3-nate; flowers long pedunculate, terminal or leaf opposed (*California*). See p. 104.

2? **Platystigma** Benth.—Flowers almost of *Platystemon;* stamens indefinite or subdefinite; filaments not dilated. Germen 3-quetrous; placentas 3, nerviform and scarcely projecting; styles 3, distinct, alternating with placentas, ovate or lanceolate, spreading, stigmatose within. Capsule opening from apex into 3 valves, placentiferous on edges.—Annual herbs, appearance and inflorescence almost of *Platystemon* (*Western North America*). See p. 105.

3. **Romneya** Harv.—Flowers almost of *Platystemon;* sepals sometimes expanded into wings. Germen divided into ∞ complete or incomplete cells; placentas intruded, 8-ovulate; carpels united into a ring, at apex diverging into as many styles, stigmatose within. Carpels ovoid, densely setose . . . ? — A branched glabrous glaucous herb; leaves pinnatifid; flowers terminal (*California*). See p. 106.

II. PAPAVEREÆ.

4. **Papaver** T.—Flowers 2- or rarely 3-merous; receptacle a

narrow cone. Sepals imbricate or contorted, very caducous. Corolla double; petals of each of similar form, imbricate or twisted, crumpled at apex, deciduous. Stamens hypogynous ∞; anthers basifixed extrorse. Germen shortly stipitate, usually 1-celled, more or less deeply septate by the intruded placentas, bearing ovules nearly all over their surface; style short, thick, soon dilated into a convex or pyramidal disk-like head, and applied to top of ovary; lobes radiating sulcate from the centre and stigmatose opposite the placentas. Capsule varying in shape, surmounted by persistent style, usually dehiscing by short pore-like valves underneath the vertex and between the placentas. Seeds ∞, subreniform, pitted: albumen copious oily; embryo thin, more or less bowed.—Perennial or annual herbs, glabrous glaucous hispid; juice milky; leaves alternate, mostly lobed or dissected; flowers terminal pedunculate; buds drooping (*Temperate and Subtropical Europe, Asia, North Africa, South Africa, Subtropical Australia, North America*). See p. 106.

5? **Meconopsis** VIG.—Flowers almost of *Papaver;* style distinct with clavate head; lobes of stigma 4–6 radiate-deflexed. Capsule ovoid or oblong, dehiscing by short valves.—Annual or usually perennial herbs; juice yellow; flowers and inflorescence of *Papaver* (*Himalaya, South Europe, North America*). See p. 110.

6. **Argemone** T.—Flowers mostly 3-merous (almost of *Papaver*); placentas of ovary 4–6, nerviform. Style short; apex dilated, depressed; lobes 4–6 opposite, placentas deflexed radiating from centre, concave stigmatose within. Capsule oblong, dehiscent by short valves, exposing placentas persisting with style. Seeds pitted. —Herbs, branched glaucescent; juice golden-yellow; leaves much pinnatifid, usually spinose-dentate or stiffly setose; flowers terminal; often erect in bud, surmounted by 3 prickles (arising from back of sepals) (*Tropical and Subtropical America, all tropical regions*). See p. 111.

7. **Cathcartia** HOOK. F.—Flowers 2-merous (almost of *Papaver*); placentas 4–6, nerviform. Style short, soon thickened into an enlarged-depressed head; lobes radiating outwards opposite the placentas. Capsule cylindrical; subdehiscent from apex to base by valves uncovering the persistent placentas and style. Seed pitted;

raphe crested.—A herb, covered with tawny hairs, juice yellow; leaves lobed; flowers long-pedunculate; buds drooping (*Himalaya*). See p. 112.

8. **Stylophorum** Nutt.—Flowers 2-merous (almost of (*Papaver*); placentas 2–4, nerviform. Style distinct erect; apex dilated, 2–4-lobed; lobes erect, alternating with placentas, stigmatose all over with deflexed sinuses. Capsule generally stipitate, ovoid oblong or linear, dehiscing from apex to base by 2–4 valves, exposing the persistent placentas together with style. Seeds of *Cathcartia*.—Perennial herbs; rhizome cylindrical; juice deep yellow; radical leaves pinnatifid or 0; cauline leaves alternate, few; those subopposite the flowers delicate, lobed or dissected; flowers pedunculate solitary or fasciculate; nutant in bud (*Central and East Asia, North America*). See p. 112.

9. **Sanguinaria** Dill.—Flowers 2-merous; sepals 2, caducous. Petals 6–12, unequal imbricate deciduous. Stamens ∞. Germen 1-celled; style short, soon enlarged subconical; lobes stigmatiferous, deflexed adnate, opposite placentas; placentas 2, nerviform; ovules ∞. Capsule stipitate, oblong, subdehiscent by valves opening lengthways, exposing linear placentas together with persistent style. Seeds ∞, smooth; raphe crested-arillate.—A herb; rhizome creeping perennial; juice orange or blood-coloured; leaves few alternate, the lower scale-like and sheathing, the upper 1, 2 palmativeined; flowers (precocious) pedunculate solitary or few (*North America*). See p. 112.

10. **Bocconia** Plum.—Flowers 2-merous, apetalous. Stamens ∞, or subdefinite. Germen 1-celled; style short; lobes stigmatose, oblong or linear, erect, connivent-subconnate or diverging at apex, alternating with placentas; placentas 2, nerviform; ovules ∞ mostly sterile, or 1 subbasilar. Capsule elliptical, stipitate, dehiscent by valves opening down to base, and exposing persistent placentas and style. Seeds few or 1, arillate at base.—Herbs or shrubs, glaucescent; juice deep yellow or red; leaves lobed; flowers in terminal, much branched compound racemes (*Tropical America, China, Japan*). See p. 114.

11. **Chelidonium** T.—Sepals 2. Petals 4, deciduous. Stamens ∞.

Germen 1-celled; style slender, short, not much dilated at apex; lobes stigmatiferous, deflexed-adnate, opposite the placentas; placentas 2, nerviform; ovules ∞. Capsule linear; subdehiscent by valves opening to base and exposing the persistent placentas together with style. Seeds shining: raphe crested-arillate.—Herbs, erect branched; juice saffron-coloured; leaves much divided; flowers in terminal or leaf-opposed subumbelliform cymes (*Europe, Temperate Asia, North America*). See p. 115.

12. **Glaucium** T.—Flowers almost of *Chelidonium*. Germen elongated. Style short or very short; apex stigmatose dilated, sub-mitriform, lobes 4, not very distinct, or 2 much larger, divaricated-deflexed, opposite the placentas. Placentas 2, nerviform, connected by a spurious cylindrical dissepiment (sometimes evanescent). Capsule elongated linear; valves dehiscing almost to base, and exposing the persistent placentas together with style; seeds ∞, wrinkled, half immersed in pits of hard spurious false dissepiment.—Glaucous herbs; juice saffron-coloured; leaves lobed or dissected; flowers large, long-pedunculate, terminal or leaf-opposed (*Mediterranean region, coasts of Europe, West Asia and North Africa*). See p. 116.

13. **Rœmeria** DC.—Flowers 2-merous (almost of *Glaucium* or *Papaver*); placentas 3, or 2, 4, nerviform; dissepiment 0; style subsessile; lobes stigmatose, little dilated, deflexed-adnate, opposite the placentas. Capsule linear, dehiscing from apex almost to base by valves exposing the persistent placentas with persistent style, or bearing them on their edges. Seeds wrinkled, not crested.—Annual herbs; habit and inflorescence of *Papaver* (*Mediterranean region, Europe, Temperate Asia*). See p. 117.

III. ESCHSCHOLTZIEÆ.

14. **Eschscholtzia** CHAM.—Flowers hermaphrodite regular; receptacle concave obconical, more or less enlarged and cupulate at apex. Perianth distinctly perigynous; sepals 3, cohering into a deciduous calyptra, or more rarely separate (*Hunnemannia*). Petals 4 in 2 series, nearly of the same form. Stamens ∞ (of *Papaver*); perigynous. Germen inserted at bottom of receptacle, 1-celled,

tapering at apex into 4–8 unequal, stigmatose, linear, divergent lobes; placentas 2, nerviform ∞-ovulate. Capsule linear, 10-furrowed, dehiscing down to base; valves inflexible, recurved, placentiferous at edges. Seeds ∞, not crested.—Herbs, glabrous glaucescent; leaves alternate multisect; lobes linear; flowers long-pedunculate (*North West America*). See p. 118.

15. **Dendromecon** BENTH.—Flowers of *Eschscholtzia;* sepals separate. Germen elongated; style short; apex stigmatose, 2-lobed; lobes alternating with placentas, erect short persistent. Fruit and seeds of *Eschscholtzia.*—A glabrous shrub; leaves alternate subsessile elliptical-lanceolate coriaceous stiff entire much veined; flowers solitary terminal (*California*). See p. 119.

IV. FUMARIEÆ.

16. **Hypecoum** T.—Flowers hermaphrodite regular 2-merous. Sepals 2, delicate. Petals 4, spreading; outer ones flat or slightly concave at base, 3-lobed or 3-crenate; inner dissimilar, narrower or more deeply lobed; æstivation imbricate or twisted. Stamens 4, opposite the petals; anthers 2-locular, extrorse, 2-rimose. Germen superior, elongated; style erect; lobes 2, subulate, stigmatiferous at apex, alternating with placentas; placentas 2, nerviform; ovules ∞, ascending; micropyle inferior introrse. Capsule linear, divided transversely between seeds by cellular partitions, sometimes continuous and dehiscing by 2 valves, placentiferous at edges (*Chiazospermum*), more frequently separating into indehiscent 1-seeded joints. Seeds compressed; albumen abundant fleshy oily; embryo bowed excentric. —Annual herbs, glaucous; leaves alternate, or floral leaves opposite, multisect; segments linear; flowers pedunculate, terminal or leaf-opposed, sometimes in short leafy pedunculate racemes (*South Europe, Temperate Asia, North Africa*). See p. 120.

17. **Dicentra** BORKH.—Flowers regular 2-merous. Sepals 2, small deciduous. Petals 4, erect-connivent; the outer wider, saccate or spurred at base; inner unlike the outer, narrower, narrowed at base, keeled or alate behind, cohering at apex. Stamens 6, in 2 equal

ranks opposite outer petals, united above the middle or from the base; middle stamen of each row often calcarate at base, and bearing a 2-celled, extrorse anther; lateral anthers 1-celled (or rather 2 cells of each anther opposite to inner petals very discrete and adnate to adjacent 2-celled anthers). Germen 1-celled; placentas 2, filiform, ∞-ovulate; style stigmatiferous; apex 2–4-lobed. Capsule varying in shape; subdehiscent by 2 valves, usually exposing the persistent placentas and style. Seeds bare or crested.—Herbs, erect or climbing; leaves multisect; flower in terminal or leaf-opposed simple or cymiferous racemes (*North America, Temperate Asia*). See p. 122.

18. **Adlumia** Rafin.—Flowers of *Dicentra*; 2 outer petals saccate and coalesced with interior at the compressed base. Other parts of *Dicentra*.—A herb, climbing by tendrils; leaves multisect; flowers in terminal or leaf-opposed racemes (*North America.*) See p. 123.

19. **Corydalis** DC.—Flowers irregular; outer petals dissimilar; one gibbous saccate or spurred at base. Stamens of *Dicentra*. Germen of *Dicentra*; placentas 2, nerviform, 1–∞-ovuled. Capsule linear, ovate, or inflated; valves exposing placentas, more or less, more rarely subcarneous and scarcely dehiscing. Seeds naked or more frequently arillate-crested.—Herbs, sometimes erect with tuberous rhizome, or cæspitose, sometimes diffuse or climbing by tendrils; leaves radical multisect; flowers usually in simple terminal or leaf-opposed racemes (*Mediterranean region, South Europe, South Africa, Central or North East Asia*). See p. 123.

20? **Sarcocapnos** DC.—Flowers of *Corydalis*; one of the outer petals spurred or gibbous at base (*Aplectrocapnos*). Ovules 1 or 2 on each of 2 placentas (*Corydalis*). Fruit short, compressed, striate, becoming dry and indehiscent, 1–2-seeded. Herbs, low cæspitose glaucous; leaves dissected; segments somewhat broad and thick; flowers in short terminal racemes (*West Mediterranean region*). See p. 125.

21. **Fumaria** T.—Flowers almost of *Corydalis*; one of outer petals gibbous or spurred at base. Germen short; style filiform; apex

subentire or 2-lobed; lobes alternating with placentas; placentas 2, nerviform; one sterile or with few ovules on either side, the other eventually bearing 1 fertile ovule above the base. Fruit small, drupaceous; mesocarp at length thin; putamen indehiscent, one-seeded.—Herbs, usually annuals, glaucous, erect branched or diffuse, or more rarely climbing subcirrhous; leaves much divided; segments usually narrow-linear; flowers in terminal or leaf-opposed spikes or racemes (*Mediterranean region, Temperate Europe and Asia, Temperate America and Australia, South Africa*). See p. 125.

XVII. CAPPARIDACEÆ.

I. CLEOME SERIES.

Cleome[1] (figs. 166–173) has regular hermaphrodite flowers with a conical receptacle. On this are inserted four sepals, free or united

Cleome spinosa.

FIG. 166.
Flowering branch (½).

to a variable extent, valvate (fig. 168) or subimbricate in the

[1] L., *Gen.*, n. 826.—J., *Gen.*, 243.—GÆRTN., *Fruct.*, i. 368, t. 76.—LAMK., *Dict.*, iv. 316; Suppl., iv. 4; *Ill.*, t. 567.—DC., *Prodr.*, i. 238.—SPACH, *Suit. à Buffon*, vi. 309.—ENDL.,

bud.[1] Above this is a corolla of four alternating free petals, twisted or imbricated in the bud. The androceum consists either of four stamens alternating with these, or, more frequently, of six stamens—two lateral, two anterior, and two posterior.[2] Each has a free filament,[3]

Cleome spinosa.

FIG. 167.
Flower.

FIG. 168.
Diagram.

FIG. 169.
Long. sect. of flower ($\frac{5}{4}$).

and an introrse two-celled anther of longitudinal dehiscence.[4] Between the perianth and androceum, the surface of the receptacle is swollen into a glandular disk, sometimes complete, sometimes only between the feet of the petals.[5] The free superior ovary is sessile or stipitate; it is narrow and elongated, surmounted by a short style ending in a more or less flattened dilatation covered with stigmatic papillæ. In the single cell of the ovary are two parietal placentas, each bearing an indefinite number of subcampylotropous ovules in two or more

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Gen., n. 4985.—PAYER, *Organog.*, 201, t. 42; *Fam. Nat.*, 134.—B. H., *Gen.*, 105, 968, n. 2.—*Micambe* MARCGR., ex ADANS., *Fam. des Pl.*, ii. 407.—*Sinapistrum* T., *Inst.*, 231, t. 116.—MŒNCH, *Meth.*, 250.

[1] They are equal or slightly unequal. They often separate from one another for a variable distance at their bases before their apices have parted. Still more frequently the petals fall to the posterior side of the flower, while the stamens protrude partially through the cleft of the perianth on the other side.

[2] They are usually inserted at some distance from the corolla, and between the two verticils the receptacle is somewhat dilated, and spherical or conical. This interval often increases with age.

[3] Either the filaments of all the stamens are equal, or else those of the lateral ones are a little shorter, as in *Cruciferæ*. They are sometimes dilated towards the apex.

[4] The pollen grains are ellipsoidal, with three longitudinal folds. Moistened, they become spherical with three glabrous bands (H. MOHL, in *Ann. Sc. Nat*, sér. 2, iii. 327).

[5] Sometimes a large gland behind is separate and prominent, into a horn or spur.

leaves with from three to seven leaflets. They inhabit the tropics in both hemispheres.

Cleome (Gynandropsis) pentaphylla.

FIG. 173. Flower.

Thus constituted,[1] the great genus *Cleome* comprises some five-score species,[2] nearly all exotics, inhabiting hot countries; some few alone come from the Mediterranean.

Wislizenia refracta,[3] a North American annual, with alternate trifoliolate leaves, and flowers in short racemes, has the tetramerous calyx and corolla of a *Cleome* with six stamens. But its long-stipitate ovary has two short didymous cells, each containing two ovules, surmounted by a long subulate style. The dry fruit is also stipitate and didymous; its hardened foot is continued into the interlocular septum, surmounted by the style; from this separate the two mono- or dispermous cells of the capsule. The seeds are reniform conduplicate; the embryo is strongly arcuate, with the apex of the incumbent cotyledons close to the radicle.[4]

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1 CLEOME sect. 16.
1. *Siliquaria* (FORSK.).
2. *Physostemon* (MART.).
3. *Polanisia* (RAFIN.).
4. *Tetrateleia* (SOND.).
5. *Ranmanissa* (ENDL.).
6. *Corynandra* (SCHRAD.).
7. *Chilocalyx* (KL.).
8? *Decastemon* (KL.).
9. *Dianthera* (KL.).
10? *Anomalostemon* (KL.).
11. *Dactylæna* (SCHRAD.).
12. *Peritoma* (DC.).
13. *Cristatella* (NUTT.).
14. *Bushia* (BGR.).
15. *Isomeris* (NUTT.).
16. *Gynandropsis* (DC.).

2 WIGHT & ARN., *Prodr.*, i. 21, 22 (*Polanisia*).—SIBTH., *Fl. Græc.*, t. 650.—GRISEB., *Fl. Brit. W. Ind.*, 15.—KL., in *Pet. Moss.*, *Bot.*, 154, 157, 159, 162.—BENTH., *Fl. Austral.*, i. 89, 91.—HARV., *Thes. Cap.*, t. 136.—HARV. & SOND., *Fl. Cap.*, i. 56, 58.—EICHL., in *Mart. Fl. Bras.*, *Cappar.*, 242, 243, 245, t. 54–58.—OLIV., *Fl. Trop. Afr.*, i. 74, 81.—BOISS., *Fl. Or.*, i. 410–416.—WALP., *Rep.*, i. 193, 195, 196; ii. 764; v. 52, 53; *Ann.*, i. 59, 60; ii. 57; iv. 223; vii. 180.

3 ENGELM., *Bot. Wisliz. Exped.*, 15, not.—A. GRAY, *Pl. Wright.*, t. 2.—B. H., *Gen.*, 106, n. 8.—WALP., *Ann.*, iii. 823; iv. 224.

4 This genus is perhaps (?) related to *Oxystylis lutea* TORR. & FREM. (in *App. Frem. Rep.*, 312; in *Duch. Rev. Bot.*, ii. 53;—B. H., *Gen.*, 107, n. 9;—WALP., *Ann.*, i. 59), a Californian plant, which we have been unable to study, but which seems to us, from the very incomplete description given of it, hardly distinct from *Wislizenia*.

II. CAPER SERIES.

The characters of the Capers[1] (Fr., *Câpriers*; figs. 174–179), vary from one section to the other. We may first study *Capparis spinosa*,[2] indigenous in France, the flower-buds of which constitute the Capers

Capparis spinosa.

FIG. 174.
Flowering branch (⅔).

of commerce. Its flowers are hermaphrodite and symmetrical, but somewhat irregular. On the convex receptacle are inserted a tetramerous calyx and corolla, a polyandrous androceum, and a

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1 *Capparis* T., *Inst.*, 261, t. 139.—L., *Gen.*, n. 643.—ADANS., *Fam. des Pl.*, ii. 407.—J., *Gen.*, 243.—LAMK., *Dict.*, i. 604; Suppl., ii. 84; *Ill.*, t. 446.—DC., *Prodr.*, i. 245.—SPACH, *Suit. à Buffon*, vi. 297.—PAYER, *Organog.*, 203, t. 41.—ENDL., *Gen.*, n. 5000.—B. H., *Gen.*, 108, 969, n. 17.

2 L., *Spec.*, 720.—DC., *Prodr.*, n. 4.—BOISS., *Fl. Or.*, i. 420.—SIBTH., *Fl. Græc.*, t. 486.—GREN. & GODR., *Fl. de Fr.*, i. 159.

long-stipitate gynæceum. The sepals are free, one anterior, one posterior, and one on either side. The two latter are covered in the bud by the two former, which are also imbricated; the posterior is usually covered by the anterior, and differs in being more concave and arched (fig. 176). The four twisted sessile petals, regularly alter-

Capparis spinosa.

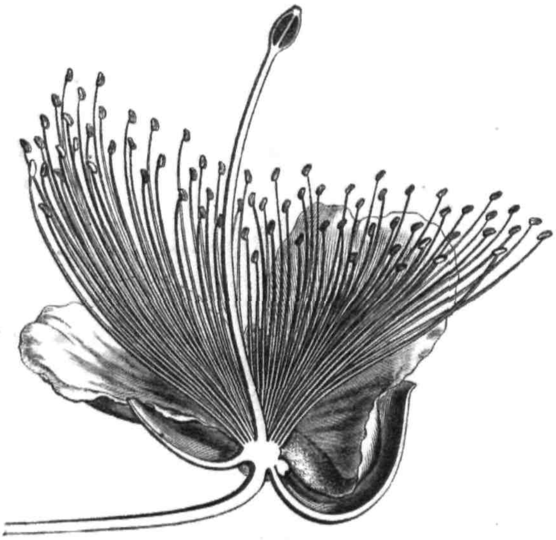

FIG. 175.
Long. sect. of flower.

nating with the sepals, form, however, an irregular corolla, as the two anterior alone have their contiguous lower edges valvate, thickened, greenish, and covered with down. Between these the receptacle swells into a little inverted heart-shaped glandular prominence. The indefinite stamens come next on the conical receptacle;[1] their filaments are free, corrugated in the bud, with an introrse two-celled anther of longitudinal dehiscence.[2] The

[1] PAYER (*loc. cit.* 205) has seen that they arise from above downwards on the receptacle; first four stamens, superposed to the sepals; then, lower down, four others, alternating with these; next eight more, alternating with the former eight; and so on from within outwards.

[2] The pollen consists of ellipsoidal grains, which, when moistened, become spherical, with three papillose bands. This is the case according to H. MOHL (in *Ann. Sc. Nat.*, sér. 2, iii. 327), in *C. spinosa*, *ægyptiaca*, *tomentosa*, *cafra*, *cynophallophora*.

gynæceum is supported by a long stalk, the prolongation of the floral receptacle; it consists of an ovary surmounted by a little subsessile stigmatiferous head. The ovary is divided into seven or

Capparis spinosa.

FIG. 177.
Fruit.

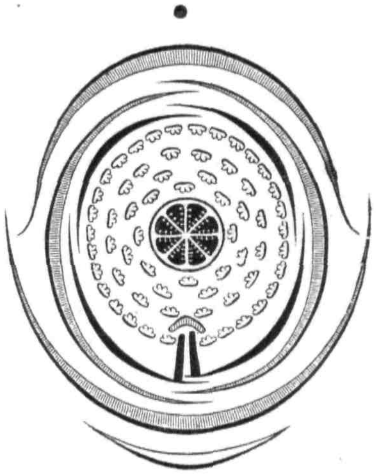

FIG. 176.
Diagram.

FIG. 178.
Seed $(\frac{5}{1})$.

FIG. 179.
Long. sect. of seed.

eight cells by very thin septa, which unite along the axis into a sort of thickened cylinder,[1] and bear on both surfaces an indefinite number of campylotropous ovules.[2] The fruit is a long stipitate berry (fig. 177), lodging in its pulp[3] a large number of campylo-

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[1] On fecundation this column becomes pulpy and scarcely visible, so that the ovary then seems one-celled, and only divided by rudiments of septa. In this respect it returns to the early stage of its ontogeny, when its single cavity was only imperfectly divided by the centripetal placentas springing from the periphery.

[2] They have two coats.

[3] In this fruit the septa become gradually thickened, soft, and pulpy. They form, together with the inner stratum of the convex wall of the cell, a whitish mass, in which the seeds are finally imbedded. This matrix gradually passes into a green zone, formed of much denser tissue, outside which are traced a variable number of white vertical lines. These show through the whitish membranous superficial layer, which may be easily detached from the rest of the pericarp.

tropous reniform seeds (figs. 178, 179); within their seed coats[1] is a fleshy embryo, with a long radicle and narrow cotyledons folded repeatedly on themselves, and containing a little fleshy albumen in their anfractuosities. The Spiny Caper[2] is a shrub with a woody stock, from which arise a large number of flexuous branches covered with alternate simple leaves, whose petiole is accompanied by two lateral stipules, gradually thickened and transformed into spines. Its flowers are solitary axillary, pedunculate. It is a plant from the Mediterranean, cultivated in gardens in France. All the nearest allied species are united with it into the section *Eucapparis*.[3]

In *Sodada*[4] the flowers and fruit are the same in all essentials, but the stem is bushy, leafless, and spiny. It is now only made a section of *Capparis*, containing one species from Africa and the East.

In *Capparidastrum*,[5] comprising species from Tropical America,[6] the sepals are small, rounded, and imbricated; the fruit is sometimes cylindroidal, much elongated. In *Cynophalla*,[7] too, the berries are very long and elongated, but the sepals are bi-seriate, imbricate, and glandular or foveolate at the base.[8] *Breyniastrum*,[9] also comprises American species,[10] with an oblong fruit; but the sepals are triangular and spreading, even in the bud. *Busbeckia*[11] has also been proposed as a distinct genus; it comprises species whose broad imbricated petals are united into a gamosepalous calyx, which bursts irregularly on anthesis. They inhabit Australia and

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[1] The seed coats are three in number. The outermost is soft and whitish; the middle one thick, hard, testaceous, brittle, and brown; the innermost thin and membranous. Towards the organic apex of the seed the triple envelopes form a sort of hollow beak, lodging the radicle. Around this the innermost coat forms a cylindro-conoidal sheath, ending in a little contracted tube. The exostome is seen with difficulty at the extreme apex of the outer coat. Close to it is the hilum, forming a little circular cicatrix, around which is a very little aril, a whitish cellular annular swelling of the superficial seed-coat. Though the seeds have been described as lacking albumen, this exists in small quantities, it is true, in the anfractuosities of the numerous folds of the irregularly convoluted embryo.

[2] [The so-called Caper plant of our English gardens is a Euphorbiad, *E. Lathyris* L.]

[3] DC., *Prodr.*, sect. i. The fruit varies in form in this section, being sometimes globular, sometimes ovoidal or obovoid. Its species are all from the Old World (DELESS., *Ic. Sel.*, t. 10–12).—? *Petersia* KL., in *Pet. Moss.*, *Bot.*, 168, t. 30.

[4] FORSK., *Fl. Ægypt.-Arab.*, 81. This section contains only *S. decidua* FORSK., which grows in Egypt, Abyssinia, Western Asia, &c.—DEL., *Fl. d'Eg.*, 74, t. 26.—DC., *Prodr.*, i. 245.—*Hombaek* ADANS., *Fam. des Pl.*, ii. 408.

[5] DC., *loc. cit.*, 248, sect. ii.—*Uterveria* BERTOL., *Pl. Nov. Hort. Bonon.*, ii. 8 (ex WALP., *Rep.*, i. 201).

[6] JACQ., *Amer.*, t. 104.

[7] DC., *loc. cit.*, 249, sect. iii.

[8] The species of this section are unarmed, all American (JACQ., *op. cit.*, t. 98, 99).

[9] DC., *loc. cit.*, 250, sect. v.—*Breynia* PLUM., *Gen. Amer.*, t. 16 (nec FORST.).

[10] JACQ., *op. cit.*, t. 100, 105.—REICHB., *Ic. Exot.*, t. 233.

[11] ENDL., *Prodr. Fl. Ins. Norfolk.*, 64; *Gen.*, n. 5001.—F. MUELL., *Fl. Vict.*, t. iv. suppl.

the neighbouring parts of Oceania. In *Calanthea*,[1] an American section,[2] the sepals are narrow and do not touch; while the petals are valvate in the bud. Finally, the name *Quadrella*[3] has been given, and generic importance assigned[4] to certain American species,[5] with valvate sepals, often possessing an internal basilar gland, and with a fruit of variable form, sometimes dehiscing at maturity; the unarmed stems bear opposite or alternate leaves.

Under the name of *Morisonia*[6] four American species[7] have been distinguished. Their calyx is gamosepalous at the base, parting unevenly into two, three, or four pieces on anthesis, with four internal alternipetalous basilar glands. The regular tetramerous corolla, the androceum of indefinite stamens, and the stipitate gynæceum, with a variable number of parietal placentas, are those of most American species of *Capparis*. The fruit is a corticate many-seeded berry. These plants have simple coriaceous leaves, tomentose or covered with scaly down, and flowers in multifloral corymbs. We make them a mere section of the genus *Capparis*, scarcely distinct from *Beautempsia*.[8]

Thus limited, the genus *Capparis* contains some hundred and twenty-five species,[9] many of them very ill-known. Their habit, surface, and inflorescence are most variable. They are confined to warm countries; their northern limit is, in Europe, the north coast of the Mediterranean; Mexico in America.

Atamisquea emarginata[10] is a low, rigid, bushy, often spiny shrub from Western America, with nearly all its parts

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1 DC., *loc. cit.*, 250, sect. iv.

2 Jacq., *Amer.*, t. 160.

3 DC., *loc. cit.*, 251, sect. vi.

4 Meissn., *Gen.*, 15.—*Colicodendron* Mart., *Herb. Fl. Bras.*, 201.—Endl., *Gen.*, n. 4999.—? *Destrugesia* Gaudich., *Voy. Bonite, Bot.*, t. 56.

5 Jacq., *Amer.*, t. 150.

6 Plum., *Gen.*, 63, t. 23.—L., *Gen.*, n. 642.—Gærtn., *Fruct.*, i. 378, t. 78.—Lamk., *Dict.*, iii. 664; *Ill.*, t. 595.—DC., *Prodr.*, i. 254.—Endl., *Gen.*, n. 5002.—B. H., *Gen.*, 107, n. 12.

7 Jacq., *Amer.*, t. 97.—Cav., *Diss.*, vi. 308, t. 163.—Sw., *Obs.*, 272 (*Capparis*).—Griseb., *Fl. Brit. W.-Ind.*, 19.

8 Gaudich., *Voy. Bonite, Bot.*, t. 56. Only the figure of this doubtful genus has been published.

9 Wight & Arn., *Prodr.*, i. 24.—Thw., *Enum. Pl. Zeyl.*, 15.—Boiss., *Fl. Or.*, i. 419.—Sibth., *Fl. Græc.*, t. 486, 487.—Del., *Fl. d'Eg.*, 93.—A. Rich., *Fl. Sen. Tent.*, i. 22, t. 5.—Kl., in *Pet. Moss.*, *Bot.*, 167.—Oliv., *Fl. Trop. Afr.*, i. 94.—Harv. & Sond., *Fl. Cap.*, i. 61.—Benth., *Fl. Austral.*, i. 93; *Fl. Hongk.*, 18.—Griseb., *Fl. Brit. W.-Ind.*, 17, 19.—Triana & Pl., in *Ann. Sc. Nat.*, sér. 4, xvii. 76.—Eichl., in *Mart. Fl. Bras.*, *Cappar.*, 267, t. 60–65.—Walp., *Rep.*, i. 127; ii. 765; v. 54; *Ann.*, ii. 60; iv. 225.

10 Miers, *Trav. Chil.*, ii. 529; in *Trans. Linn. Soc.*, xxi. 1, t. 1.—Hook. & Arn., *Bot. Misc.*, iii. 143.—Endl., *Gen.*, n. 4992.—B. H., *Gen.*, 109, 969, n. 19.—H. Bn., in *Adansonia*, x. 28.—Walp., *Ann.*, iv. 224.

Cadaba[1] in perianth comes pretty near certain species of *Capparis;* for of the four unequal caducous sepals, two are external and valvate, enveloping the others. There are either four petals, or only two, according to the species. There are from four to eight stamens, below which the receptacle is often prolonged into a large tubular or solid prominence, sometimes ending in a sort of galeate dilatation. The stipitate ovary contains two or four multi-ovulate placentas. The fruit is a cylindrical berry, dehiscent or indehiscent. A dozen species of *Cadaba* are known, unarmed or spiny shrubs from Tropical Africa, and Asia, and the Cape, with simple or trifoliolate leaves, and axillary flowers, solitary or collected into racemes or corymbs.[2]

Euadenia,[3] closely allied to *Cadaba*, links it with *Cratæva.* The calyx and corolla are tetramerous; but the posterior pair of petals are much more developed than the other pair. There are five stamens, and a stipitate gynæceum like that of *Cadaba;* but the gynophore bears posteriorly, between the two large petals, a very long appendage ending in five lobes or bearing five distinct glands. The fruit is a globular or elongated berry. The two known species of this genus are glabrous shrubs from the west of Tropical Africa.[4] Their leaves are trifoliolate, and their flowers form terminal racemes.

In *Cratæva*[5] also the calyx has four imbricate sepals, and the corolla four equal or unequal petals with long claws, and the posterior may be larger than the anterior. The stamens vary from eight to twenty in number; near their insertion the receptacle is more or

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TH., *Hist. des Vég. des Iles Austr. d'Afr.*, 26 (*Capparis*).—KL., in *Pet. Moss., Bot.*, 164.—WALP., *Rep.*, v. 53.

[1] FORSK., *Fl. Ægypt.-Arab.*, 67.—LAMK., *Dict.*, ii. 544.—DC., *Prodr.*, i. 224.—ENDL., *Gen.*, n. 4993.—B. H., *Gen.*, 108, 969, n. 15.—*Stræmia* VAHL., *Symb.*, i. 19.

[2] The genus is divided into three sections: 1. *Eucadaba* (ENDL., *loc. cit.*, a). Petals 0 or 4; stamens 4–6; leaves simple. (DELESS., *Ic. Sel.*, iii. t. 8, 9.—HOOK., *Icon.*, t. 839.—BENTH., *Fl. Austral.*, i. 92.—OLIV., *Fl. Trop. Afr.*, i. 88.—HARV., *Thes. Cap.*, t. 135.—WALP., *Rep.*, v. 53.)—2. *Desmocarpus* (WALL., *Cat.*, n. 6978). Petals 2; stamens 6; fruit incompletely bivalve; leaves trifoliolate. (WIGHT, in *Hook. Bot. Misc.*, App., t. 37.—THW., *Enum. Pl. Zeyl.*, 15.—WALP., *Rep.*, i. 196.)—3. *Schepperia* (NECK., *Elem.*, n. 1392;—DC., *Prodr.*, i. 245;—ENDL., *Gen.*, n. 4991;—*Macromerum* BURCH., *Trav.*, i. 388). Petals 0; stamens 8; a leafless shrub. (L., *Suppl.*, 300 (*Cleome*).—SCHLTL., in *Linnæa*, i. 255, t. 3.—HARV. & SOND., *Fl. Cap.*, i. 59.—HARV., *Thes. Cap.*, t. 135.)

[3] OLIV., in B. H., *Gen.*, 969, n. 22 *a*; *Fl. Trop. Afr.*, i. 90.

[4] SCHUM. & THÖNN., *Beskr.*, 144 (*Stræmia*).

[5] L., *Gen.*, n. 599.—J., *Gen.*, 244.—LAMK., *Dict.*, viii. 581; Suppl., v. 283; *Ill.*, t. 395.—DC., *Prodr.*, i. 242.—SPACH, *Suit. à Buffon*, vi. 301.—ENDL., *Gen.*, n. 5003.—B. H., *Gen.*, 110, 969, n. 21.—*Othrys* NORONH., ex DUP.-TH., *Gen. Nov. Madag.*, 13.

less hypertrophied between the petals into distinct glandular lobes or a cupuliform disk; but we do not find the enormous backward process of *Euadenia* and certain *Cadabas*. The long-stipitate ovary has two placentas; and the globular or ovoidal berry internally resembles a Caper. *Cratæva* consists of glabrous trees or shrubs, with trifoliolate leaves, and handsome flowers, often polygamous, and collected into axillary and terminal racemes. Some half-dozen species are known.[1]

Boscia[2] has little tetramerous apetalous flowers. The sepals, usually caducous, are valvate or scarcely imbricate in the bud. At the foot of the stipitate gynæceum is found a little glandular disk, at the level of which are inserted from six to twenty stamens. The ovary, surmounted by a little depressed sessile stigma, has two parietal pauciovulate placentas. The fruit is generally globular, with one or few seeds in the incomplete cells. The embryo is fleshy and scented, rolled up, with traces of albumen between the folds. *Boscia* consists of unarmed glabrous shrubs from Tropical Africa.[3] Their leaves are simple, articulate, with two small lateral stipules; their flowers are in small racemes or corymbs.

In *Ritchiea*,[4] a neighbour of *Boscia*, the flowers are regular and tetramerous with a valvate calyx, but they are large, with a small expansion of the receptacle above the perianth, and four[5] long unguiculate petals forming wavy ribbons, and valvate-induplicate in the bud. On the convex top of the above-mentioned receptacular dilatation are inserted the indefinite stamens, from the middle of which rises the long slender foot of the ovary. The ovary, surmounted by a large sessile stigma, contains three or four multiovulate placentas. The fruit is an oblong stipitate berry, like that of certain Capers. The three or four known species[6] of this genus

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[1] R. BR., in *Denh. & Clapp. Voy. App.*, 223.—DELESS., *Ic. Sel.*, iii. t. 7.—WIGHT & ARN., *Prodr.*, i. 23.—THW., *Enum. Pl. Zeyl.*, 14.—FORST., *Prodr.*, 203.—A. RICH., *Fl. Sen. Tent.*, i. 25.—OLIV., *Fl. Trop. Afr.*, i. 99.—GRISEB., *Fl. Brit. W.-Ind.*, 17.—TRIANA & PL., in *Ann. Sc. Nat.*, sér. 4, xvii. 87.—EICHL., in *Mart. Fl. Bras.*, *Cappar.*, 263, t. 59.—WALP., *Rep.*, i. 201; v. 55.

[2] LAMK., *Ill.*, t. 395 (nec THUNB.).—DC., *Prodr.*, i. 244.—ENDL., *Gen.*, n. 4996.—B. H., *Gen.*, 108, 969, n. 16.—*Podoria* PERS., *Syn.*, ii. 5.

[3] A. RICH., *Fl. Sen. Tent.*, i. 25, t. 6.—OLIV., *Fl. Trop. Afr.*, i. 92.—WALP., *Rep.*, i. 196; *Ann.*, i. 60; ii. 59.

[4] R. BR., in *Denh. & Clapp. Voy. App.*, 223.—ENDL., *Gen.*, n. 5004.—B. H., *Gen.*, 110, 969, n. 22.

[5] Their number is indefinite in *R. simplicifolia* OLIV.

[6] HOOK. F., *Niger*, 216, t. 19, 20.—SIMS, in *Bot. Mag.*, t. 596 (*Cratæva*).—ANDR., in *Bot. Repos.*, t. 176 (*Cratæva*).—OLIV., *Fl. Trop. Afr.*, i. 100.—*Bot. Mag.*, t. 5344.—WALP., *Rep.*, i. 201; *Ann.*, i. 60; ii. 61.

thus defined consists of unarmed shrubs from India, Madagascar, Arabia, and above all the east of Tropical Africa. Their leaves are simple or unifoliolate, more rarely trifoliolate. The flowers are axillary or terminal, solitary or in racemes or corymbs. Some twenty species are known.[1]

IV. ? ROPALOCARPUS SERIES.

Ropalocarpus (figs. 184, 185)[2] has regular hermaphrodite flowers. They have four sepals, an outer pair and an inner pair, alternate-

Ropalocarpus lucidus.

FIG. 184.
Fruit.

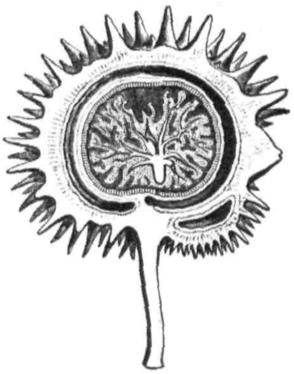

FIG. 185.
Long. sect. of fruit.

imbricate in the bud. There are also four alternating petals, equal or slightly unequal, tapering at the base, unequally dentate or incised at the apex, finely reticulate, of very delicate texture, imbricated and slightly corrugated in the bud, very caducous. Immediately above the perianth are inserted the indefinite free stamens; their filaments are corrugated in the bud, and their anthers are versatile (originally introrse) and two-celled, dehiscing longitudinally. After thus bearing the perianth and androceum, the receptacle

[1] VAHL., *Symb.*, i. 36.—DELESS., *Ic. Sel.*, iii. t. 13.—WIGHT & ARN., *Prodr.*, i. 23 (*Niebuhria*).—A. RICH., *Fl. Sen. Tent.*, i. 27, t. 78.—CAMBESS., in *Jacquem. Voy.*, *Bot.*, t. 23, 24.—HOOK., *Icon.*, t. 124 (*Niebuhria*).—HARV. & SOND., *Fl. Cap.*, i. 60 (*Niebuhria*), 61 (*Boscia*).—HARV., *Thes. Cap.*, t. 134 (*Boscia*).—OLIV., *Fl. Trop. Afr.*, i. 83.—WALP., *Rep.*, i. 196, 197; v. 53; *Ann.*, ii. 59.

[2] BOJ., *Hort. Maurit.*, 44 (err. typ. *Rapolo carpus*).— B. H., *Gen.*, 238, 985, n. 32?—BOCQ., in *Adansonia*, vii. 61.

is prolonged into a depressed truncated cone, with its small base inferior. Its large base supports the gynæceum, and is edged by a disk forming a glandular ring. The short ovary, covered with rigid hairs, is surmounted by a slender subulate style, whose stigmatiferous apex is almost entire and scarcely expanded. Inside the ovary is seen a usually complete vertical membranous septum; in either cell is a subbasilar placenta, bearing from two to four subcollateral ovules, with the raphe dorsal and the micropyle downwards and inwards. The fruit is, generally speaking, spherical in form, surmounting a pretty long peduncle and bristling with conical prickles. On close inspection we find an obtuse conical point, the true apex, which is brought down towards the base by a sort of anatropy due to the almost complete arrest of development in one of the cells of the ovary. This cavity is found, small and sterile, close to the base of the fruit; while in the fertile cell we find a suberect ellipsoidal seed with its long axis horizontal, containing inside its coats a ruminated albumen. The inferior radicle is shortly conical; the two cotyledons are enormous, membranous and translucent, with laciniate edges, whose rumpled lobes spread in all directions between the two laminæ of each fold of the ruminated albumen. *R. lucidus* Boj., the only known species of this genus, is a glabrous shrub from Madagascar, with alternate simple leaves and the habit of several *Capparidaceæ*. Its stipules are more or less united into a single caducous triangular intrapetiolar organ. The flowers are in pedunculate cymes (?) axillary to the leaves, or to the bracts replacing them at the ends of the branches.

V.? MORINGA SERIES.

Moringa[1] (figs. 186–190) has hermaphrodite irregular flowers; their receptacle is cup-shaped, lined by a glandular disk with a prominent free border; on its oblique mouth are supported the perianth and androceum, while the gynæceum springs from the

[1] Burm., *Zeyl.*, 162.—J., *Gen.*, 348.—Gærtn., *Fruct.*, ii. 314.—Lamk., *Dict.*, i. 398; Suppl., 390, 613; *Ill.*, t. 147.—DC., *Mém. Légum.*, t. 21; *Prodr.*, ii. 478.—R. Br., in *Denh. & Clapp. Voy. App.*, 33.—Dcne., in *Ann. Sc. Nat.*, sér. 2, iv. 203, t. 6.—Endl., *Gen.*, n. 6811.—Payer, *Fam. Nat.*, 94.—B. H., *Gen.*, 429, 1001.—H. Bn., in *Adansonia*, ix. 333.—*Hyperanthera* Forsk., *Fl. Ægypt.-Arab.*, 67.—Vahl, *Symb.*, i. 30.—*Anoma* Lour., *Fl. Cochinch.*, 344.—*Alandina* Neck., *Elem.*, n. 1293.—*Hypelate* Sm., in *Rees. Cyclop.*, xix. (nec P. Br.)

bottom. The calyx consists of five slightly unequal sepals, of quincuncial præfloration. The five alternating petals are usually of cochlear-imbricate præfloration. The anterior, internal in the bud, and differing in form slightly from the rest, remains erect on

Moringa pterygosperma.

FIG. 186.
Flower ($\frac{2}{1}$).

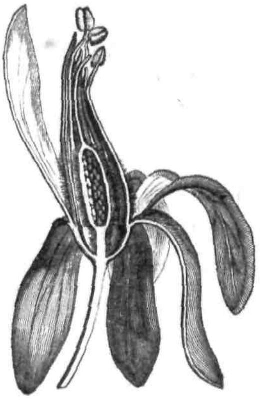

FIG. 187.
Long. sect. of flower.

FIG. 188.
Fruit ($\frac{1}{3}$).

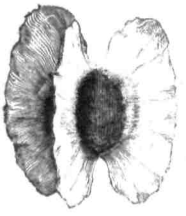

FIG. 189.
Seed.

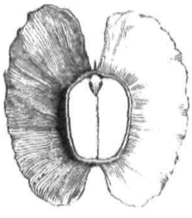

FIG. 190.
Long. sect. of seed.

anthesis, while they become reflexed on the receptacle, like the sepals. There are ten stamens, perigynous, five superposed to the petals and five to the sepals; the former are usually sterile, reduced to the filaments,[1] sometimes very slender; the five others have a dorsal fixed one-celled introrse anther of longitudinal dehiscence:[2] moreover the

[1] The filaments are free at their origin, more or less covered with hairs below. Later on they stick together to a variable extent.

[2] The pollen is ovoid, with three folds; in water it becomes spherical, with three papillose bands (H. MOHL, in *Ann. Sc. Nat.*, sér. 2, iii. 343).

androceum is most developed towards the anterior side of the flower; so that the fertile stamen superposed to the enveloped anterior petal is the longest of all, while the posterior pair are the shortest. The gynæceum consists of a stipitate ovary, surmounted by a slender cylindrical tubular style, undilated at its stigmatiferous apex.[1] In the one-celled ovary there are three[2] parietal placentas, whereof two are posterior. Each bears an indefinite number of descending anatropous ovules, with their micropyles upwards and inwards. The fruit is a siliquiform elongated trigonous capsule, which at maturity opens by three longitudinal clefts into three valves, bearing the seeds on the middle of their inner surface. The seeds, more or less separated by a peculiar fungous tissue,[3] are winged or wingless,[4] and contain in their coats a large, fleshy, oily, exalbuminous embyro, with a short superior radicle. *Moringa* consists of unarmed trees or shrubs, with alternate bi- or tri-imparipinnate leaves. Their divisions are opposite, and the leaflets are entire and caducous. The petioles, petiolules, and leaves are all articulated at the base; the petiole is exstipulate, or has stipitate glands at its base, which are sometimes also found at the origin of the petiolules and leaflets. The flowers are very numerous, in much ramified racemes of cymes. Three species of *Moringa*[5] are known, natives of the warm districts of North Africa and South Western Asia; one has been introduced into nearly all tropical countries.

Thus we admit seventeen genera in the order *Capparidaceæ*. This was originally distinguished in B. DE JUSSIEU's[6] list of *Ordines naturales*, under the name *Capparides*, including the then known *Capparidaceæ*, besides *Tropæolum*, *Viola*, *Reseda*, *Melianthus*, and

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[1] Perforated in the centre.

[2] Exceptionally we do find two or four carpels, with the same number of placentas and valves to the fruit.

[3] Produced from the inner wall of the pericarp.

[4] There are no wings on the seeds of *M. aptera*, which are triangular, each angle corresponding to the meeting point of two adjacent valves of the fruit. In *M. pterygosperma* the superficial seed-coat is here hypertrophied into a vertical wing, which extends into the sinus between the two valves. These wings are imbricated with those of their neighbouring seeds, which may at maturity be arranged in a single vertical row along the axis of the capsule. The number of wings will vary of course with that of the valves, and also because the wing may exceptionally remain rudimentary on one or two angles of the seed, or not be formed at all, as is normally the case in *M. aptera*.

[5] WIGHT & ARN., *Prodr.*, i. 178.—WIGHT, *Ill.*, t. 77.—GRIFF., *Notul.*, iv. 572, t. 609 (*Hyperantha*).

[6] In *A. L. de Juss. Gen.*, lxvii.

Marcgravia. ADANSON[1] separated *Viola*, introducing, however, *Vitis* and *Passiflora*. But A. L. DE JUSSIEU[2] increased the prevailing disorder of this group, by adding as *genera affinia Drosera* and *Parnassia*, besides the Malvad *Durio*. A. P. DE CANDOLLE[3] in 1824 banished from this order the genera which did not belong to it, retaining only (to use our generic limits) *Cleome*, *Cratæva*, *Boscia*, *Cadaba*, *Steriphoma*, *Stephania*, *Thylachium*, and *Mærua*. To these eight genera R. BROWN added *Ritchiea* in 1826. *Roydsia* was established by ROXBURGH in 1819, and *Atamisquea* by MIERS in 1848. Of recent date are *Wislizenia* of ENGELMANN, *Apophyllum* and *Emblingia* of F. MUELLER, and *Euadenia* of OLIVER; to these we add, as types of somewhat doubtful series in this order, *Ropalocarpus* of BOJER, and *Moringa* of BURMANN.

These seventeen genera contain some three hundred genera, of which *Cleome* and *Capparis* contain each nearly a third. Among the fifteen remaining genera three alone are peculiar to America. *Steriphoma*, with three known species, *Atamisquea*[4] and *Wislizenia*, both monotypic. The twelve others are proper to the Old World. Three of them alone are monotypic: *Ropalocarpus*, from Madagascar; *Apophyllum* and *Emblingia*, both Australian. In Tropical and South Africa is the favoured home of *Capparidaceæ*. Besides its numerous species of *Capparis* and *Cleome*, the continent and neighbouring islands are the sole birthplace of *Boscia*, *Thylachium*, *Euadenia*, and *Ritchiea*, with the greater part of *Mærua* and *Cadaba*. The other species of the two last genera extend into Arabia, and even India, the sole country of *Roydsia*. *Moringa* belongs to Tropical Asia and the warm regions of Eastern Africa. *Cratæva*, comprising only half a dozen species, is however spread over a wide area in the Tropics, occurring in the hottest parts of West and East Africa, Asia, and the Indian Archipelago, Australia and Polynesia, the Antilles, Brazil, and the neighbouring parts of South America. In this respect its geographical distribution is comparable to that of *Cappa-*

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1 *Fam. des Pl.*, ii. (1763), 402, Fam. li.
2 *Gen.*, 242, Ord. IV.
3 *Prodr.*, i. 237, Ord. XII.
4 Its only known species extends about forty degrees on either side of the equator in the west of America (see *Adansonia*, x. 28).

ris and *Cleome.* The genus *Capparis* extends to 40° S. in Australia, the Cape, and La Plata. Northwards it extends to about 30° in America, above 40° in Asia, and not far from 50° in the Mediterranean.

The *Capparidaceæ* have long been divided into two tribes: *Cleomeæ,* with a dry capsular fruit, dehiscent by thin valves; and *Capparideæ,* with a fleshy fruit; the former usually herbaceous, with compound leaves, the latter woody; and in this group most of the genera have a convex floral receptacle, and hence a hypogynous perianth and androceum. In *Mærua,* on the contrary, the receptacle is hollow and obconical, with the perianth and androceum on its rim. Thus these plants are analogous to *Eschscholtzieæ* among Papaverads; hence we propose to make a distinct series for them. Last come the two series of somewhat doubtful position, represented by *Ropalocarpus* and *Moringa.* We now give the general characters of our five series:—

I. Cleomeæ.—Insertion hypogynous. Receptacle often produced into a cylinder. Fruit dry capsular, often siliquiform, one-celled, dehiscent. Plants herbaceous; often annual. (2 genera.)

II. Cappárideæ.—Insertion hypogynous. Fruit fleshy (berry or drupe.) Plants woody. (12 genera.)

III. Mærueæ.—Insertion perigynous. Receptacle concave. Fruit fleshy. Plants woody. (1 genus.)

IV.? Ropalocarpeæ.—Insertion hypogynous. Receptacle obconical short. Placentation brought down towards the base of the ovary. Fruit dry (?) indehiscent. Stem woody. Leaves simple. (1 genus.)

V. Moringeæ.—Insertion perigynous. Receptacle concave. Fruit capsular siliquiform dehiscent, usually 3-valvate. Stem woody. Leaves compound, 2-, 3-pinnate. (1 genus.)

Thus the characters whereby we distinguish these series from one another are chiefly to be found in the consistency of the stem and pericarp, and the form of the floral receptacle. The other particulars of organization, on the variation of which we found our secondary and tertiary divisions, are as follows:—

The leaves are sometimes simple, sometimes compound. The latter is nearly always the case in *Cleomeæ;* but in *Capparideæ* this

character is valueless, varying from one species to another in the same genus. Nor is the presence or absence of stipules of more value. Still we must lay stress on the union of the two intrapetiolar stipules into a single organ in *Ropalocarpeæ*; and the presence of little glandular bodies in place of stipules and stipels in *Moringeæ*. The leaves are simple in the former, decompound in the latter.

The flowers are usually hermaphrodite; but polygamo-diœcious in *Apophyllum*. The regularity or irregularity of the perianth is of no use as a generic characteristic; for in *Capparis*, *Cleome*, *Cratæva*, *Cadaba*, &c., we find both regular and irregular corollas. Apetaly is sometimes considered of generic import; thus it occurs in *Boscia*, *Thylachium*, and *Roydsia*; but their perianth has some other peculiarity in the number of its parts or the mode of dehiscence. But mere apetaly is insufficient, for *Mærua* and *Cadaba* have some species apetalous, others with corollas. Nor is the number of stamens, definite or indefinite, or of carpels and placentas more serviceable. The genera *Steriphoma* and *Thylachium* have been defined by the dehiscence of their calyx, which will alone separate them from *Capparis*. If we look at this last genus, and see, indivisible as it now appears, the considerable variations found in the number of parts of the floral whorls, in the præfloration, in the relative form and size of the parts of a single verticil, and even the arrangement of the placentas, which may be parietal, or divide the ovary up into complete cells, we shall understand that all these characters must lack any real significance in the group as a whole.

The same remark may be applied to the form of the fruit. Since in the genus *Capparis* it may assume every possible form, from a perfect sphere to a narrow cylinder, thirty or forty times as long as it is thick, we can nowhere in this order retain genera only founded on the difference of the diameters of the pericarp.

The chief affinities of *Capparidaceæ* are in no way doubtful. The order is allied to *Papaveraceæ*, *Resedaceæ*, and *Cruciferæ*.[1] Of the first it lacks the double corolla, the copious albumen, the milky juice

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[1] J. G. AGARDH says, moreover (*Theor. Syst.*, 209): "*Capparidaceæ* sunt Oxalideis et Tropæolis collaterales, floribus 4-meris et axi intra florem valde elongato diversæ."

with its peculiar properties. We shall see that *Resedaceæ*, which A. L. DE JUSSIEU included in the *genera affinia* of this order, are separable therefrom by no absolute character. Through *Cleomeæ*, especially the types with a dry siliquiform dicarpellary fruit, and a hexandrous androceum, we are brought so near *Cruciferæ* that the only absolute distinction lies in the habit, and the false septum in the fruit of the latter. True, there are other differential characters, but they are inconstant: the organization of the leaves in *Capparidaceæ*, the frequent asymmetry of the flowers,[1] the number of stamens, the long support of the fruit, and the direction of the ovules. Other secondary affinities must be noted. Such doubtful *Capparidaceæ* as *Ropalocarpus* have been referred to *Tiliaceæ*. This closely linking of this order to *Bixaceæ* through *Prockia* enables us to see why *Aphloia* has been placed among *Capparidaceæ*, because of the form of the embryo. *Moringa*[2] shows close analogies with *Leguminosæ*, differing essentially only in the number of its parietal placentas; and *Cordyla*, which belongs to the Leguminose series *Tounateæ* or *Swartzieæ*, was formerly placed in *Capparidaceæ*,[3] and is only really distinguished therefrom by its single placenta.

Differences in properties[4] answer to the differences in histology between this order and *Papaveraceæ*. Its properties are on the whole very nearly those of *Resedaceæ* and *Cruciferæ*, the vegetative organs usually containing acrid or stimulant, antiscorbutic juices, and the seeds an oily substance. The European Caper-plants are well-known for the use made of their flower-buds (more rarely the young fruit) as a stimulant aperient digestive condiment. Our Capers are the pickled buds of *C. spinosa*[5] (figs. 174–179); but those of *C. ægyptia*[6]

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[1] EICHL., *Exc. Morph.*, in *Mart. Fl. Bras.*, *Cappar.*, 338, t. 68.

[2] See *Adansonia*, ix. 335, for the enumeration of the different groups to which *Moringa* has been referred, even bringing it near *Monopetalæ*, such as *Bignoniaceæ*. AGARDH (*op. cit.*, 211) says of *Moringeæ* :—"Capparideis collaterales aut paulo superiores, floribus 5-meris subsymmetricis et staminibus perigynis ad Leguminosas transeuntes."

[3] *Fl. Seneg. Tent.*, i. 30, t. 9.

[4] ENDL., *Enchirid.*, 457.—LINDL., *Veg. Kingd.*, 358; *Fl. Med.*, 94.—ROSENTH., *Syn. Pl. Diaph.*, 646.

[5] L., *Spec.*, 720.—BLACKW., *Herb.*, t. 417.—DC., *Prodr.*, i. 245, n. 4.—GUIB., *Drog. Simpl.*, ed. 6, iii. 671.—LINDL., *Fl. Med.*, 94.—A. RICH., *Elém.*, ed. 4, ii. 380, t. 80.—ROSENTH., *op. cit.*, 648 (see above p. 149, note 2).

[6] LAMK., *Dict.*, i. 605.—DEL., *Fl. Ægypt.*, 93, t. 31, fig. 3.—DC., *Prodr.*, n. 7.

are used the same way in Egypt, like those of *C. Fontanesia*[1] in Barbary, and *C. rupestris*[2] in Greece. The bark of the roots of most of these species tastes bitter and pungent; that of *C. spinosa* was formerly used as an aperient and deobstruant. We find much more marked properties in the roots of several species from Equinoctial America; the bark is not only stimulant but vesicating. Hence the use of that of *C. cynophallophora*,[3] *Breynia*,[4] *jamaicensis*,[5] *ferruginea*,[6] in the Antilles; it is also considered emmenagogue, diuretic, and hydragogue. The fruit of *C. Breynia* is held antispasmodic, and its flowers and root antihysteric and aperient. This idea may be due to the fœtid smell of most of these plants; for the same excrementitious smell characterizes many antispasmodic remedies. *C. Morisonia*,[7] one kind of the *Mabouia-wood* of the Antilles, is thought to have similar qualities. The fruit of *C. frondosa*[8] and *pulcherrima*,[9] are reputed poisonous in the same countries. VON MARTIUS says that horses and mules have died from eating the leaves of *C. Yco*, in Brazil.[10] Strangely enough, other species of the same genus are considered antidotal. The leaves of *C. Dahi* FORSK. and *C. mithridatica* FORSK. are rubbed in on snake-bites in Egypt. In India, *C. Reedii*, *Heyneana*, and *brevispina* are prescribed for vermin and many other affections. The fruits of *C. Sodada*[11] are simply edible; but then they are always cooked beforehand in Egypt and Arabia. In *Cadaba* and *Cratæva* we find the same diversity of properties. *Cadaba indica*[12] is thought an anthelmintic; *C. farinosa* is chewed, and its powder is used as

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1 DC., *Prodr.*, n. 5.—*C. ovata* DESF., *Fl. Atl.*, i. 404 (nec BIEB.).

2 SIBTH. & SM., *Fl. Græc.*, t. 487.—DC., *Prodr.*, n. 3. This species and the preceding ones are held to be mere forms or varieties of *C. spinosa* by W. D. G. KOCH (in *Rœhl. Deutsch. Fl.*, iv., ex *Ann. Sc. Nat.*, sér. 2, iii. 370). *C. rupestris* he would make an unarmed variety of *C. spinosa*.

3 L., *Spec.*, 721.—DC., *Prodr.*, i. 249, n. 61.—LINDL., *loc. cit.*, n. 199.

4 JACQ., *Amer.*, 161, t. 103.—L., *Spec.*, ed. 2, i. 721.—DC., *Prodr.*, i. 252, n. 95 (nec SW.).—TRIANA & PL., in *Ann. Sc. Nat.*, sér. 4, xvii. 80.—*C. amygdalina* LAMK., *Dict.*, i. 608.—*C. barcelonensis* H. B. K., *Nov. Gen. et Spec.*, v. 92.—*Breynia indica* L., *Spec.*, ed. 1, 503 (*Fève du diable*, *Bois caca*, of the Antilles).

5 JACQ., *Amer.*, t. 101.

6 L., *Amœn.*, v. 598.—P. BR., *Jam.*, t. 28, fig. 1.—DC., *Prodr.*, i. 251, n. 89.—*C. octrandra* JACQ., *Amer.*, t. 100.

7 SW., *Obs.*, 272.—*Morisonia americana* L., *Spec.*, 719.—JACQ., *Amer.*, t. 97.—DC., *Prodr.*, i. 244.

8 JACQ., *Amer.*, 162, t. 104.—DC., *Prodr.*, i. 249, n. 54.

9 JACQ., *Amer.*, 163, t. 106.—DC., *loc. cit.*, n. 250.

10 EICHL., in *Mart. Fl. Bras.*, *Cappar.*, 272, t. 60.—*Colicodendron Yco* MART., *Syst. Mat. Med. Bras.*, 72; *Herb. Fl. Bras.*, 201.

11 *Sodada decidua* FORSK., *Fl. Ægypt.-Arab.*, 81.—DEL., *Fl. Ægypt.*, 74, t. 26.—DC., *Prodr.*, i. 245.

12 LAMK., *Dict.*, i. 544.—*Cleome fruticosa* L., *Spec.*, 937.—BURM., *Fl. Ind.*, t. 46, fig. 3.

an antiseptic. The American species *Cratæva gynandra*[1] and *Topia*[2] have a bitter bark, the decoction of which is a tonic, stomachic, and febrifuge. Their root is very acrid, even vesicant. The leaves of *C. religiosa*[3] are prescribed internally as a stomachic, externally as a counter-irritant. *C. Nurwala* HAM., of India, is prized there for its edible fruits of vinous flavour; and the berries of *C. magna*[4] are eaten in Cochin China. Those of *Boscia senegalensis*[5] are eaten by the negroes of the Senegal; they also treat headache by a topical application of a paste made of the leaves, or the vapour of water in which they are boiled. The root is reputed a vermifuge; and the scraped wood gives a sweet taste to water, which is then used to make cakes. Nevertheless the flowers have the stercoraceous odour of those of so many species of *Capparis* and other genera. The series *Cleomeæ* also contains many stimulant, or even vesicant, diuretic, aperient species. *Cleome pentaphylla*[6] has the properties of Cress or Horseradish in the tropical countries where it abounds. *C. triphylla*[7] is used in Hayti as an antiscorbutic and diuretic. *C. viscosa*[8] is used topically in affections of the ears, and its seeds are used as a condiment, like mustard. *C. felina* and *icosandra*[9] are used in India as a vermifuge and epispastic; the root of the latter cures tapeworm.[10] The flowers are used to season salads, like our nasturtiums (*Tropæolum*). The leaves of *C. pentaphylla* are eaten in Dongala, under the name of *Brèdes puantes*.[11] The oil in the embryo of the *Capparideæ* is seldom extracted for use. But large quantities are extracted from that of the *Ben nut* (*Moringa*) in warm countries,

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[1] L., *Spec.*, 636.—H. B. K., *Nov. Gen. et Spec.*, v. 86?—LINDL., *Fl. Med.*, 95 (*Palo de Guaco*, *Sorrocloco* of New Granada; *Garlick Pear* of Jamaica.

[2] L., *Spec.*, 637.—PIS., *Bras.*, t. 69.—MACF., *Fl. Jam.*, i. 37.—EICHL., in *Mart. Fl. Bras.*, *Cappar.*, 264, t. 59.

[3] FORST., *Prodr.*, 203.—DC., *Prodr.*, i. 243, n. 2.—OLIV., *Fl. Trop. Afr.*, i. 99.—*C. guineensis* SCH. & THÖNN., *Beskr.*, 240.—*C. læta* DC., *loc. cit.*, n. 3.—*C. Adansonii* DC., *loc. cit.*, n. 5.—A. RICH., *Fl. Sen. Tent.*, i. 25 (*Khed-kred* of Senegal; *Kada-kukku* of India).

[4] In East Africa they also eat the seeds of *Mærua virgata* (figs. 182–184).

[5] LAMK., *Ill.*, t. 395.—DC., *Prodr.*, i. 244.—A. RICH., *Fl. Sen. Tent.*, i. 25.—*Podoria senegalensis* PERS., *Syn.*, ii. 5 (*Djandam* of the natives).

[6] L., *Spec.*, 938.—*Bot. Mag.*, t. 1681.—*C. acuta* SCHUM. & THÖNN., *Beskr.*, 293.—*Gynandropsis pentaphylla* DC., *Prodr.*, i. 238, n. 3.—*G. denticulata* DC., *loc. cit.*, n. 4.

[7] L., *Spec.*, 938.—*Gynandropsis triphylla* DC., *Prodr.*, i. 237, n. 2.

[8] L., *Spec.*, 938.—*Polanisia graveolens* RAFIN., in *Journ. Phys.* (Aug. 1819), 98.—DC., *Prodr.*, i. 242, n. 5.

[9] L., *Spec.*, 938.—BURM., *Fl. Zeyl.*, t. 99.—*Polanisia viscosa* β DC., *loc. cit.*

[10] AUBLET also cites *C. frutescens* of Guiana, as being as strong an irritant as cantharides.

[11] The following species are also cited as useful: *Cleome spinosa* and *polygama*, balsamic and stomachic; *C. pruriens*, whose irritant hairs are sternutatory (see EICHL., *loc. cit.*, 287).

especially in Egypt and Arabia. There oil is extracted from the seeds of *M. aptera*;[1] it is sweet, inodorous, and limpid, does not easily turn rancid, and finally separates into two parts, one of which coagulates, while the other always remains fluid. It is used in the extraction of certain perfumes, and the more fluid part is often used by the watch-maker. The embryo is bitter and purgative, acrid especially when fresh, and then a rubefacient; it is considered a febrifuge in the East. In Egypt the seed is extensively brought to market. It grows on plants raised in Cairo and the neighbourhood from seed imported from Sennaar. The seeds are exported to Syria and Palestine on account of their medicinal and alimentary uses. This is thought to be the tree that BELON saw on Sinai, and named *Balanus myrepsica*, adding, that the inhabitants "industriously gather its seed, whereof they make a great quantity of oil." It is not, however, found there now; the Arabs have probably cut down and destroyed all these trees for charcoal. Probably a similar use might be made of the winged *Ben*,[2] from Tropical India, which also contains a quantity of oil; but it does not appear to have been used much hitherto.

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1 GÆRTN., *Fruct.*, ii. 315.—DC., *Prodr.*, ii. 478, n. 3.—DECNE., in *Ann. Sc. Nat.*, sér. 2, iv. 203, t. 6.—GUIB., *Drog. Simpl.*, ed. 6, iii. 387.—LINDL., *Fl. Med.*, 103.—*M. zeylanica* L., *Spec.*, 546.—PERS., *Syn.*, i. 460.—? *M. Nux Ben* DESF., ex DEL., *Fl. Ægypt.*, 81.—*Balanus myrepsica* BEL., *Obs.*, 126 (ed. 1553).—BLACKW., *Herb.* t. 386?

2 *Moringa pterygosperma* GÆRTN., *op. cit.*, 314, t. 147.—DC., *loc. cit.*, n. 1.—*M. oleifera* LAMK., *Dict.*, i. 398.—*Guilandina Moringa* L., *Spec.*, 546. — *Hyperanthera Moringa* VAHL, *Symb.*, i. 30.—? *Anoma Moringa* LOUR., *Fl. Cochinch.* (ed. 1790), 279.

GENERA.

I. CLEOMEÆ.

1. **Cleome** L.—Flowers regular or more rarely sub-irregular, 4-merous; calyx dentate or partite, persistent or deciduous, more rarely circumcissile at base, valvate or slightly imbricate. Petals 4, equal or unequal, sessile or unguiculate, entire or dentate, or more rarely laciniate (*Cristatella*). Receptacle convex or slightly concave (*Isomeris*) at base, naked above the perianth, or produced behind into an appendage of variable form. Stamens 4, 5, or usually 6, equal or sub-4-dynamous, more rarely 8–∞ (*Polanisia*), free, inserted on the elongated cylindrical receptacle immediately above the perianth, or a little higher, or very high (*Gynandropsis*); filaments free, often declinate; all or many, or more rarely 1 (*Dactylæna*) antheriferous, sometimes subinflated beneath anthers; the rest antherless; anthers introrse, 2-celled, 2-rimose. Germen stipitate, or more rarely subsessile, elongated, or more rarely subovate, or shortly trapezoid (*Cleomella*); placentas 2, parietal, anterior and posterior, more rarely 3–∞; ovules few, or usually ∞, subanatropous or campylotropous; stigma on elongated style, or more frequently subsessile or sessile; micropyle superior. Capsule membranous or inflated, or bladder-like coriaceous (*Isomeris*), cylindrical or compressed, or shortly ovoid or flask-shaped, or trapezoidal (*Cleomella*), glabrous or glandular, or prickly. Seeds few, more frequently ∞, reniform, glabrous, or scrobiculate rough or woolly; embryo sometimes albuminous, bowed, induplicate or convolute; cotyledons incumbent; radicle conical superior.—Herbs, often annual, undershrubs, or more rarely small trees, often glandular stinking; leaves simple, or digitately 3–5–7–9-foliolate; stipules 0, or small herbaceous, or spinescent; flowers solitary, or generally racemose; racemes simple or branched, bracteate or leafy (*All Tropical and Subtropical, rarely Temperate regions*). See p. 144.

2. **Wislizenia** ENGELM.—Flowers 4-merous; sepals short imbri-

cate deciduous. Petals shortly unguiculate, imbricate. Stamens 6, inflexed in æstivation; filaments finally elongated; anthers exserted, 2-locular. Germen long-stipitate; cells 2, didimous 2-ovulate, style slender, subulate. Capsule didymous, on a slender reflexed stipe; lobes tuberculate, at length separating from perforated septum, 1-seeded. Seed conduplicate, arcuate-reniform; embryo much incurved; cotyledons incumbent.—An annual glabrous herb; leaves alternate 3-foliolate; stipules fimbriate; flowers in short terminal and axillary racemes (*New Mexico*). See p. 148.

II. CAPPARIDEÆ.

3. **Capparis** T.—Flowers hermaphrodite, regular or irregular; receptacle convex. Sepals 4, or very rarely 5, equal or unequal, free or connate, sometimes unequally torn, bare within, or with a basilar gland, or internal or lateral ligula; valvate or imbricate in æstivation. Petals alternate, 4, or more rarely ∞, imbricate. Stamens usually ∞, sometimes inserted on a glandular receptacle, free; anthers introrse 2-rimose. Germen long-stipitate; cells 1–∞; septa incomplete or complete, bearing ∞ ovules; style very short, or next to none, soon dilated into a stigmatiferous lamina. Fruit a berry, or more or less corticate, very variable in shape, globular ovoid or much lengthened-siliquiform, sometimes constricted between the seeds, indehiscent, or more rarely obscurely dehiscent. Seeds ∞, embedded, reniform; testa coriaceous or oftener crustaceous; embryo exalbuminous; cotyledons fleshy and convolute about the very long radicle.—Trees or shrubs, sometimes climbing, unarmed spinose or aculeate, glabrous tomentose or variably lepidote; leaves alternate, or more rarely opposite, very rarely 0, membranous or coriaceous, deciduous or persistent; stipules setaceous or spinescent; flowers axillary or supra-axillary, solitary or fasciculate, sometimes superposed, or in terminal racemes or corymbs, usually bracteate (*All Tropical, Subtropical, and Temperate regions*). See p. 149.

4. **Atamisquea** MIERS.—Flowers hermaphrodite (small); receptacle unequally cyathiform, produced beyond perianth, excentric and concave in front, with 3 alternipetalous tongue-shaped glandules at

edges, 1 anterior longer; 2 lateral shorter, a little more internal. Sepals 4, 2-seriate; outer ones (antero-posterior) much larger, concave, scaly externally, closely valvate; inner ones lateral, smaller, subspathulate, attenuate at edges. Petals 4, slightly unequal; anterior 2 subdissimilar to posterior 2. Reproductive parts inserted on top of dilated bowed column, concave and keeled in front. Stamens 9, 6 fertile (2 anterior, 2 lateral, and 2 posterior); filaments free; anthers introrse, basifixed, at length curved, 2-rimose; sterile 3 antherless; anterior 1 longer, alternipetalous; lateral 2 between anterior and lateral fertile ones on each side. Germen slender stipitate elongated-ovoid, densely lepidote; stigma sessile, acute, placentas 2, ∞-ovulate; ovules 2-seriate. Berry ovoid, subcarneous, densely lepidote, apiculated by persisting style, 1-celled, with a little pulp, indehiscent, bursting on pressure into 4 valves; replum persistent. Seeds 1, 2, cochleate-reniform; embryo exalbuminous hippocrepiform; cotyledons incumbent, plicately convolute on one another.—A branched rigid shrub, with scurfy elæagnoid scales; twigs divaricating, sometimes spinescent; leaves alternate or subopposite, small linear-oblong petiolate; flowers pedunculate axillary to the 1, 2 superior leaves of the branch (*Chili, Bolivia, California*). See p. 153.

5. **Apophyllum** F. MUELL.—Flowers polygamo-diœcious, almost of *Capparis;* sepals 3, 4, imbricate. Petals 2–4, imbricate; anterior 2 often wanting. Stamens 0 or 1–3 in female flower, sometimes fertile; ∞ in male flower; filaments filiform inserted on short depressed receptacle; anthers introrse. Germen (0 in male flower) stipitate; ovules 1, 2 ascending, parietal or subbasilar; stigma sessile. Berry stipitate pisiform. Seeds 1, 2, smooth; embryo exalbuminous; cotyledons circinately involute.—A branched almost leafless shrub; branches virgate terete; leaves small linear; flowers aggregated into lateral fascicles (*Tropical Australia*). See p. 154.

6. **Roydsia** ROXB.—Sepals connate from very base, imbricate. Stamens ∞, inserted a little above short calyx on erect cylindrical column; filaments free; anthers introrse 2-rimose. Germen shortly stipitate, 3-locular; ovules ∞, inserted in central angle; style divided into 3 subulate strips. Drupes shortly stipitate, ovoid; puta-

men woody; seed 1; test membranous; embryo thick; cotyledons unequal, the larger embracing the induplicate smaller one.—Shrubs; leaves alternate simple shortly petiolate exstipulate; flowers in simple or branched axillary, or terminal, and sometimes much-branched racemes; pedicels 1-bracteate (*East Indies, Philippine Islands*). See p. 154.

7. **Steriphoma** Spreng.—Calyx gamosepalous, cylindrical-campanulate, irregularly torn, 2–4-lobed, valvate; glandules 4 within at base, alternisepalous, concave-elliptical, scale-like. Petals 4, very shortly unguiculate, inserted on short column, somewhat above calyx, equal or slightly unequal, imbricate. Stamens 5, 6 inserted along with petals; filaments free, finally long-exserted, unequal; anthers lengthened, introrse, 2-rimose. Germen stipitate; placentas 2, parietal, finally coherent in the centre; ovules ∞, 2-seriate; stigma sessile. Berry corticate, pulpy. Seeds ∞, immersed; embryo fleshy; cotyledons spirally convolute.—Shrubs, with stellate pubescence; leaves simple (1-foliolate) long-petiolate; flowers in terminal racemes (*Tropical America*). See p. 155.

8. **Thylachium** Lour.—Calyx gamosepalous, membranous, valvate, at length unequally torn, and dehiscing transversely as an operculum. Corolla 0. Stamens ∞, inserted on short column, a little above calyx, free; anthers introrse rimose twisted. Germen long stipitate, 1-locular; placentas 4–10; ovules ∞; stigma sessile. Berry "oblong" stipitate ∞-seeded.—Unarmed shrubs; leaves alternate, simple or 3-foliolate; leaflets entire or panduriform; flowers in short terminal and axillary corymbose racemes (*Islands of East Tropical Africa*). See p. 155.

9. **Cadaba** Forsk.—Sepals 4; unequal; 2 outer interior overlapping, valvate, all deciduous. Petals 4, unguiculate; 2 larger; or 2 (*Desmocarpus*), more rarely 0 (*Schepperia*). Stamens 4–6, or more rarely 8 (*Schepperia*), inserted far above corolla on top of erect cylindrical column. Germen long-stipitate; placentas 2–4; ovules ∞, 2-seriate; stigma small sessile. Berry cylindrical coriaceous, sometimes indehiscent, sometimes dehiscing by 2 valves (*Desmocarpus*). Seeds ∞, subglobose; embryo fleshy; radicle conical;

cotyledons incumbent convolute.—Unarmed or spinescent shrubs, sometimes leafless; leaves usually 1- or 3-foliolate; stipules 2; flowers axillary solitary, or in racemes or corymbs (*Asia, Tropical Africa*). See p. 156.

10. **Euadenia** OLIV.—Flowers nearly of *Cadaba;* sepals free, open in æstivation. Petals 4; 2 posterior much elongated. Stamens 5, inserted with or a little above corolla. Germen stipitate; gynophore produced at base into a long linear appendage between the 2 larger petals; apex of appendage 5-lobed or 5-glandular; placentas parietal, ∞-ovulate; stigma subsessile. Berry subglobular or oblong, indehiscent; seeds ∞, immersed in pulp.—Glabrous shrubs; leaves 3-foliolate; flowers in terminal racemes (*Tropical West Africa*). See p. 156.

11. **Cratæva** L.—Flowers 4-merous, hermaphrodite, or polygamous by abortion; receptacle nearly flat, or slightly concave, lined by an equally or unequally-lobed disk, somewhat prominent between the petals. Calyx imbricate. Petals equal, or 2 posterior longer, long-unguiculate, open in æstivation. Stamens 8–∞; filaments filiform, elongated. Germen long-stipitate; placentas 2, parietal or connate at centre; ovules ∞, ∞-seriate; stigma discoid, subsessile. Berry stipitate, ovoid, or globular, corticate. Seeds ∞, immersed reniform; cotyledons incumbent, convolute; radicle conical. —Shrubs or trees, glabrous lenticellate; leaves 3-foliolate; flowers in terminal or axillary corymbs (*All Tropical regions*). See p. 156.

12. **Boscia** LAMK.—Sepals 4, valvate or slightly imbricate, deciduous, inserted on a short glandular torus. Corolla 0. Stamens 6–∞, inserted on top of torus, free or slightly connate at base. Germen stipitate; placentas 2, pauciovulate; style short; apex capitate stigmatose. Berry subglobular, more or less long-stipitate; pericarp occasionally coriaceous. Seeds 1–∞, immersed; embryo fleshy; cotyledons convolute; radicle long. — Unarmed shrubs; leaves simple; petiole articulate; stipules minute; flowers (usually small) in racemes or corymbs (*Tropical Africa*). See p. 157.

13. **Ritchiea** R. BR.—Sepals 4, equally valvate. Petals 4, alter-

dorsifixed 1-celled introrse 1-rimose. Germen stipitate, inserted in bottom of receptacle, 1-celled; style terminal slender tubular; apex stigmatose, truncated, perforated; placentas 3, parietal; 2 posterior; ovules ∞ on each placenta, descending, anatropous; micropyle introrse, superior. Capsule rostrate siliquiform, 3–6- or more rarely 2–4–8-gonous, torulose, 1-celled, 3- or more rarely 2- 4-valved, ... es bearing in the middle of their sides ∞ 1-seriate see , separated by spongy spurious septa; seeds ovate, wi ... wings as valves; embryo exalbuminous straight; ... anulate, 5-lobed, split oily; radicle superior short; plumule many-leaved.- ... posterior sep... abounding in an odoriferous gum; leaves alternate decidu... recepta... yx, 2–3-pinnate; pinnæ and pinnules opposite, occasionally s... glandule leaves entire caducous; stipules 0, or present at base of petiole and pinnæ as sometimes stipitate glandules; flowers in axillary much branched cymiferous racemes (*Warm Asia, North-east Africa*). See p. 161.

XVIII. CRUCIFERÆ.

1. WALLFLOWER SERIES.

.ommence the study of this order with the genus *Cheir-*

Cheiranthus Cheiri (*Wallflower*).

Fig. 191.
Flowering branch.

anthus,[1] of which one species, the Wallflower (Fr., *Giroflée Jaune;* figs. 191–200), is often cultivated in our parterres, and flowers in

Cheiranthus Cheiri.

FIG. 192.
Flower.

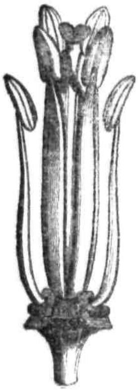

FIG. 196.
Flower, perianth removed.

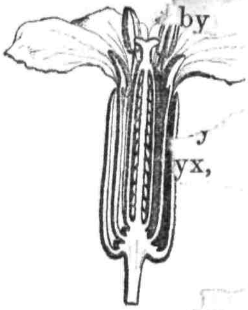

FIG. 194.
Long. sect. of flower.

FIG. 195.
Petal.

FIG. 193.
Diagram.

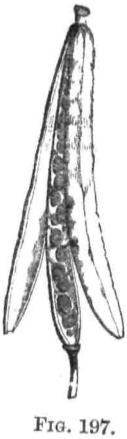

FIG. 197.
Fruit.

early spring. Its flowers are regular hermaphrodite, with a convex receptacle forming a depressed cone. It bears near its base a cruciate calyx of four free sepals, alternative-imbricate in the bud (fig.

[1] L., *Gen.*, n. 815.—ADANS., *Fam. des Pl.*, ii. 418 (*Cheiri*).—J., *Gen.*, 238.—R. BR., in *Ait. Hort. Kew.*, ed. 2, iv. 118.—DC., *Syst. Veg.*, ii. 178; *Prodr.*, i. 135.—SPACH, *Suit. à Buffon*, vi. 406. — ENDL., *Gen.*, n. 4848. — PAYER, *Organog.*, 214, t. 44; *Fam. Nat.*, 138.—HOOK. F. & THOMS., *Præcurs. ad Fl. Ind.* (*Crucif.*), in *Journ. Linn. Soc.*, v. 136.—B. H., *Gen.*, 68, n. 5.—*Schelhammeria* HEIST., *Helmst.*, 36.

193). Two are antero-posterior (or placentary); they have flat bases inserted along a very open arc; in the bud they cover the lateral (or carpellary) pair. These are dilated and boat-shaped at the base; and the scar of their insertion on the receptacle is much curved.

Cheiranthus Cheiri.

FIG. 198. Seed.

FIG. 199. Transverse section of seed ($\frac{8}{1}$).

FIG. 200. Embryo ($\frac{4}{1}$).

There are four alternipetalous petals, forming a cruciform corolla. Each one (fig. 193) consists of a long narrow claw, and a much broader blade, which is inclined to the claw. The præfloration is somewhat variably imbricated; as a rule one petal is wholly external, one wholly internal, and the two others are covered on one edge and overlapping on the other (fig. 193). The androceum is tetradynamous; *i.e.*, of its six stamens four are larger than the remaining two. The latter are superposed to the lateral sepals, the four large ones are superposed in pairs to the antero-posterior two.[1] Around the foot of the stamens the receptacle swells into a green glandular tissue, constituting what have been termed the nectaries, or disks. In this species they form two large irregular islands, surrounding the feet of the short stamens (fig. 193). Each stamen (fig. 196) has a free subulate filament, and an introrse two-celled anther of longitudinal dehiscence.[2] The gynæceum is superior; it has a subsessile narrow elongated subcylindrical ovary, surmounted by a short style, whose apex is divided into two little lateral diverging lobes, covered on their inner faces with stigmatic papillæ. The ovary is one-celled, with two antero-posterior parietal placentas. Each bears two series of funiculate descending campylotropous ovules, whose micropyles look upwards and inwards;[3] and between its series

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[1] Certain authors hold that these are oppositipetalous, and form a distinct whorl to the lateral stamens.

[2] The pollen of *Cruciferæ* is generally formed of opaque ovoid grains, with three folds. H. MOHL (in *Ann. Sc. Nat.*, sér. 2, iii. 327) distinguishes those with a cellular and with a dotted external membrane. In the former the bands are smooth (*Raphanus Raphanistrum*, *Sinapis arvensis*, *Cardamine pratensis*), or cellular (*Cheiranthus annuus*, various species of *Iberis*). In *Cheiranthus incanus* and *tricuspidatus* there are no folds.

[3] They have two coats.

of ovules each placenta advances to meet its fellow, and form an antero-posterior false septum, which divides the ovary into two false-

Cardamine pratensis (*Cuckoo-flower*).

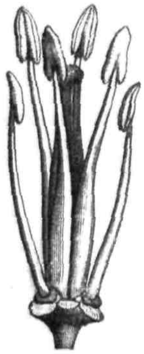

FIG. 204.
Flower, perianth removed.

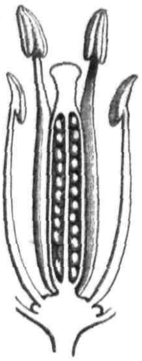

FIG. 205.
Long. sect. of flower.

cells.[1] The fruit is a *siliqua*, that is a narrow elongated polyspermous fruit, opening when ripe by four longitudinal clefts into three pieces. Two of them are the lateral valves. The third (median) piece, from which they separate, is composed of the hardened placentas, forming a narrow vertical antero-posterior frame of about the same breadth as the valves; on them is strained the membranous false-septum, on either side of which are borne, before and behind, a row of seeds on free slender funicles. Each campylotropous descending seed contains within its coats[2] a bowed fleshy embryo, whose radicle

---

[1] Frequent anomalies occur in this genus and many others, the carpels becoming free, separating from the placenta, having their number increased, &c. The last is often due to the transformation of several stamens into supernumerary carpels, as shown in figs. 201–203, which are external to the normal carpels, and unite with them or remain free. (See LINDL., in *Bot. Reg.* t. 1168.—AD. BR., in *Bull. Soc. Bot. de Fr.*, viii. 454.—H. BN., in *Adansonia*, iii. 351, t. 12, &c.)

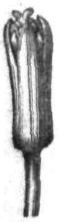

FIG. 201.

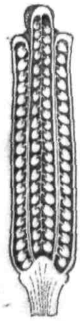

FIG. 203.

FIG. 202.

[2] Edged by a membrane in *Dichroanthus* (WEBB, *Phyt. Canar.*, i. 65, t. 5, 6), that is, in the section *Cheiroides* (DC.), where the fruit is tetragonal, with a slender style; not marginate in the other section (*Cheiri* DC.), with a compressed fruit, and scarcely any style.

is closely folded on the cotyledons. It is applied to their edges and therefore termed *accumbent.*

Cheiranthus comprises herbs and undershrubs with fine bifurcated or more rarely stellate hairs scattered over their organs. Their leaves are alternate, simple, elongated, entire or dentate. Their flowers form terminal racemes, in which the alternate pedicels are not axillary to bracts. In some species[1] with all the other characters of the genus the radicle is *incumbent,* that is applied not to the edges of the cotyledons, but across the side of one of them. The genus comprises a dozen species,[2] natives of the temperate regions of Europe, West and Central Asia, North Africa, and North America.

Notoceras hispanicum.

FIG. 206. Fruit.

The Rock-cresses (*Arabis* ; Fr., *Arabette*), closely allied to the Wallflowers, especially in fruit, are only distinguished therefrom by characters that would be held of slight value in other genera, but which here rise greatly of necessity, when we have to divide so close and natural an order into genera. The lateral sepals are sometimes like the other two. The siliqua is thin linear compressed sessile, and its valves are plane or carinate (figs. 206–208). The seeds are arranged in one row, more rarely in two, on either side of the false septum, and may be marginate or even winged, or else wingless. *Arabis* has given its name to the first subseries in this group, the *Arabidineæ,* usually[3] characterized by the accumbent radicle. Therein are included twenty genera: *Cheiranthus, Atelanthera, Nasturtium,*[4] *Barbarea, Arabis, Streptanthus, Cardamine* (figs. 204, 205), *Dryopetalum, Macropodium, Leavenworthia,*

Parolinia ornata.

FIG. 207. Gynæceum (⁴⁄₁).

FIG. 208. Long. sect. of gynæceum.

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[1] Especially in *C. Menziesii* (*Hesperis Menziesii* HOOK., in *Beech. Voy., Bot.*, t. 75), type of the genus *Phœnicaulis* (NUTT., ex TORR. & GR., *Fl. N. Amer.*, i. 89). The same thing occurs at times in *C. Cheiri* and the allied species of our gardens.

[2] REICHB., *Ic. Fl. Germ.*, t. 45.—BOISS., *Fl. Or.*, i. 185.—GREN. & GODR., *Fl. de Fr.*, i. 86.—WALP., *Rep.*, i. 124; ii. 755; *Ann.*, iv. 192; vii. 98.

[3] Here, as in *Cheiranthus* and generally in the members of this order, this character is, as we shall see, though convenient in practice, far from absolute, and many exceptions to it have been cited. (See *Adansonia*, x. 48.)

[4] According to A. GRAY, we should regard

Loxostemon, *Morettia*, *Notoceras* (fig. 206,) *Andrzejowskia*, *Parolinia* (figs. 207, 208), *Parrya*, *Cithareloma*, *Matthiola*, *Lonchophora*, and *Anastatica* (fig. 209), only differing in minor characters, which will be given in detail later,[1] and which chiefly refer to the habit; the similar or dissimilar insertion of the sepals; their form; that of the siliqua; the presence or absence of appendicular prominences (of very variable form) on its valves; the form of the stigmatiferous apex of the style, which may be simply capitate, entire, and covered uniformly with papillæ, or more or less deeply bilobate, with the lobes erect, connate, or more or less decurrent on the style.

Anastatica hierochuntina (*Rose of Jericho*).

FIG. 209. Fruit $(\frac{3}{1})$.

The flowers of *Sisymbrium* (figs. 214, 215) are formed as in most of the preceding genera; and so, on the whole, is the siliqua. But the cotyledons are incumbent; that is to say, their radicle is folded against the

Tetrapoma barbareifolia TURCZ. (figs. 210–213) as an anomaly of *Nasturtium palustre* R. BR., not as the type of a distinct genus, for, although its ovary has three or four placentas, in other respects its organization is quite that of a *Nasturtium* (see the *Genera* below). The style is thick, broad, subentire on top (figs. 210–212); four hypogynous glands are seen at the base of the ovary; when there are four placentas thei arrangement is cruciate (figs. 211, 213). We must note that in our gardens this anomaly is retained more or less completely, and reproduced from year to year by seed.

Tetrapoma barbareifolia.

FIG. 210.

FIG. 211.

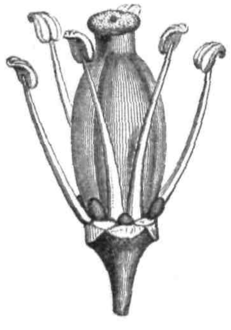

FIG. 212.

FIG. 213.

[1] See the *Genera* below.

outer face of one of the cotyledons, not on their commissure; they are straight, convolute or more or less folded on themselves transversely, but not longitudinally. Only exceptionally are they accumbent; and by this character, slight though its importance be, we distinguish the series *Sisymbrineæ*, containing twenty-one genera: *Sisymbrium*, *Conringia*, *Erysimum*, *Porphyrocodon*, *Smelowskia*, *Zerdana*, *Christolea*, *Greggia*, *Syrenia*, *Pachypodium*, *Stanleya*, *Warea*, *Streptoloma*, *Dontostemon*, *Lepidostemon*, *Malcolmia*, *Hesperis*, *Tetracme*, *Schizopetalon* (fig. 216), *Heliophila* (fig. 217, 218), and *Chamira*. These genera are distinguished from each other mainly by the following traits: the siliqua has rarely horns towards its apex (*Tetracme*), and may be sessile or stipitate; the style is simple, capitate or divided into two short lobes, or two longer lobes, free erect, or connate and coalescing into a single conical body. The cotyledons may be folded once, or more rarely twice, on themselves; the stamens are free, exappendiculate, or else the longer ones have a basal appendage or tooth; finally the petals, usually entire, are pinnatifid in the one genus *Schizopetalum*.

Sisymbrium Alliaria (Garlic-mustard).

FIG. 214. Fruit.

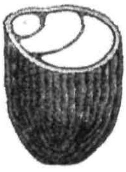

FIG. 215. Transverse sect. ($\frac{8}{1}$).

Schizopetalon Walkeri.

FIG. 216. Flower.

With the same general organization in flowers and fruit, the Cabbages[1] (Fr., *Choux*; 219–241) have been made the type of a third subseries *Brassicineæ*, only because their seeds differ in the folding of the cotyledons on themselves and the radicle. Their flowers, nearly the same as those

Heliophilia variabilis.

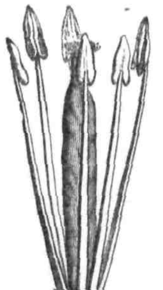

FIG. 217. Flower, perianth removed ($\frac{4}{1}$).

FIG. 218. Long. sect. of flower.

[1] *Brassica* T., *Inst.*, 219, t. 106.—L., *Gen.*, 820.—ADANS., *Fam. des Pl.*, ii. 417.—DC., *Syst. Veg.*, ii. 582; *Prodr.*, i. 213 (part.).—SPACH, *Suit. à Buffon*, vi. 356.—ENDL., *Gen.*,

of *Cheiranthus* or *Sisymbrium*, have like them a convex receptacle forming a depressed cone. The two lateral sepals are more or less gibbous or saccate above their insertion. They may be

Brassica oleracea (*Cabbage*).

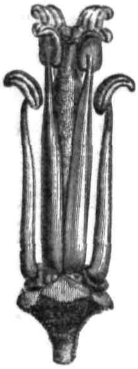

FIG. 220.
Flower, perianth removed ($\frac{4}{1}$).

FIG. 221. Fruit.

FIG. 223. Transverse section of seed ($\frac{8}{1}$).

FIG. 219. Inflorescence.

FIG. 222. Fruit dehiscing

erect or spreading in the expanded flower. The petals are unguiculate, cruciate, variably imbricated in the bud. Near the base of the six stamens, with free subulate filaments,[1] is seen a disk of four

n. 4949.—PAYER, *Leç. sur les Fam. Nat.*, 137.—B. H., *Gen.*, 84, 967, n. 77.—? *Corynelobos* RŒM., in *Linnæa*, xxv. 7.

[1] Certain monstrous flowers occur, like that of fig. 225, which belongs to a Mustard, a sub-genus that, like several recent authors, we include in *Brassica* (see pp. 191, 192, figs. 235–241), with the anthers sterile and ill-developed. This condition is associated with partial or complete virescence of the petals, considerable hypertrophy of the ovary, which is here vesicular and foliaceous, and which in many such flowers has a median vertical groove before and behind, but an incomplete false-septum, or even none at all. We also frequently find in such cases an atrophy of the style, with the ovules usually transformed into green foliaceous blades of very variable form

FIG. 225.

glands. Two of these are carpellary, placed inside the little lateral stamens, and are bowed, concave externally. The placentary pair, usually narrow and elongated, more rarely depressed, are external to and between the two large stamens of each pair. The fruit is elongated and cylindroidal, somewhat compressed perpendicular to the septum, which is nearly as broad as the valves. These bear one or three ill-marked longitudinal ribs; the lateral ones are often flexuous. The ovary is surmounted by a short or elongated style, ending in a truncate stigmatiferous head, entire, depressed in the centre, or more or less bilobate. The seeds are spherical or oblong, in one row on either side of the septum, with free funicles. The radicle of the large fleshy embryo is folded across the middle of one of the cotyledons. These are conduplicate, or folded transversely, one outside and parallel to the other, and in the fold of the latter lies the embryo. The genus consists of herbs or rarely undershrubs, with often erect branching stems, glaucescent and glabrous, or hairy. The flowers[1] form leafless, simple or more rarely branched racemes. This genus is the most instructive for study of all in this immense order; first, on account of the diverse modes of evolution of its vegetative organs, found again in the other genera; next, because of the way its various sections stand apart or shade off into one another; whence we learn the real value of the characters on which authors have based their separations of the genera of this order.

Brassica oleracea (*caulo-rapa*) (*Kohl-Rabi*).

FIG. 224.
Young plant ($\frac{1}{10}$).

As regards their vegetative organs, the Cabbages present that evolution in two stages which has been misnamed biennial, and which were better termed dicarpic, or dicarpian. True, the forms of the common Cabbages known as Green Cabbages,[2] or Cabbages without

and size. This kind of anomaly, observed pretty frequently in the commoner Crucifers, is determined by the prick of an insect, or the development of *Erysiphe* or some other parasitic fungus.

[1] Yellow, more rarely whitish.

[2] *B. oleracea* L., *Spec.*, 932.—*B. pinnatifida* DESF., *Fl. Atl.*, t. 65 (ex SPACH, *Suit. à Buffon*, vi. 359).—*Napus oleracea* SPENN.

a head[1] (*Choux verts, C. sans tête*) long continue vegetating and developing leaves on a common stem, which elongates without thickening much. Here the successive evolution of the leaves exhausts the nutritive juices as they are formed in the plant; but they may accumulate in some part of the plant in the varieties with two periods of vegetation. This is the case in the Savoys[2] (*Choux*

Brassica oleracea (*caulo-rapa*).

FIG. 226.
Flowering plant ($\frac{1}{10}$).

Brassica oleracea (*gemmifera*). (*Brussels-sprouts*).

FIG. 227.
Habit ($\frac{1}{8}$).

pommés, cabus, fig. 232). Here, in the first period, the juices first accumulate in the head, that is, in the petioles, ribs, and veins of the fleshy crowded leaves, which are imbricated on the top of the

[1] *B. oleracea* var. B., *acephala* DC., *loc. cit.*—SPACH, *loc. cit.*, 361. — *B. oleracea viridis* LAMK., *Dict.*, i. 743, n. 2.

[2] *B. oleracea capitata* DC.—SPACH, *loc. cit.*, 364.

stem. In the second period the plant flowers, and these reservoirs

Brassica campestris (oleifera).

FIG. 229.
Fruit.

FIG. 228.
Inflorescence ($\frac{1}{2}$).

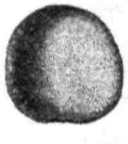

FIG. 230.
Seed ($\frac{6}{1}$).

FIG. 231.
Long. sect. of seed.

of nutriment are emptied to supply the rapid evolution of the

Brassica oleracea (capitata). (Savoy.)

FIG. 232.
Habit ($\frac{1}{8}$).

Brassica oleracea (Botrytis). (Cauliflower.)

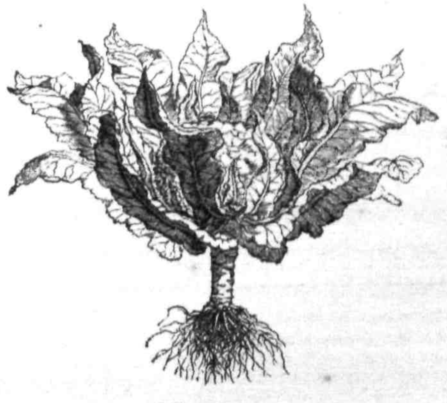

FIG. 233.
(Habit ($\frac{1}{8}$).

inflorescence. In the Brussels Sprouts (*Choux de Bruxelles*, fig. 227) numerous lateral buds in the axils of the leaves form the storehouses in the period of growth, and form little edible heads. In the Cauliflower (*Choux-fleurs*,[1] fig. 233) and Broccoli the large mammillated edible head is formed by the transitory accumulation of nutritive matter in the whole of the inflorescence which ends the plant after the first period of vegetation. The reservoir is far lower down in Kohl Rabi[2] (*Chou-rave*), where it is in the swollen base of the stem, on which may even be seen the insertion of the leaves (figs. 224, 226), and yet lower in the Turnips[3] (*Choux-navels*, fig. 234), where it is in the enormous tap-root without any leaf-scars, used for food by both man and beast. These variations are all found in the section which we shall call *Eubrassica*,[4] the fruit of which is a sessile siliqua, whose valves bear a prominent midrib, and flexuous lateral ribs. It comprises dicarpic herbs, natives of Europe and Asia.[5]

Brassica Napus (Turnip).

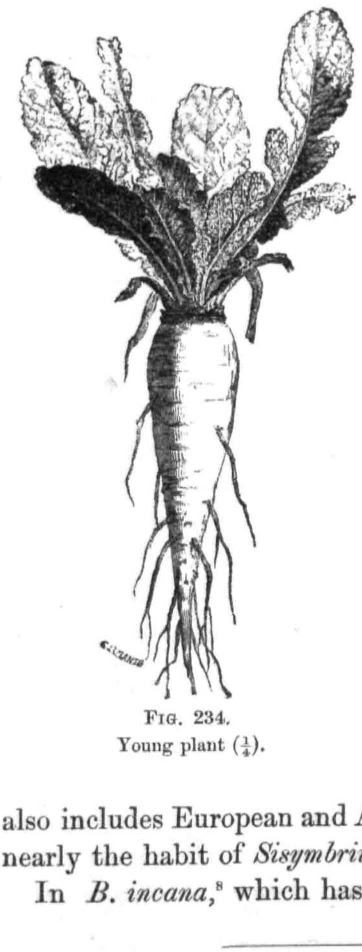

FIG. 234.
Young plant ($\frac{1}{4}$).

In *Erucastrum*,[6] by some made a distinct genus, the siliqua is narrow, with but one rib on each valve. This also includes European and Asiatic herbs,[7] annual and perennial, with nearly the habit of *Sisymbrium*.

In *B. incana*,[8] which has also been made into the distinct genus

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1 *B. oleracea botrytis* DC., *Prodr.*, i. 284, F.

2 *B. oleracea gongyloides* L. (?).—SPACH, *loc. cit.*, 366.—*B. oleracea caulo-rapa* DC.

3 *B. Napus* L., *Spec.*, 931.—DC., *Syst.*, ii. 592; *Prodr.*, i. 214, n. 4.—GREN. & GODR., *Fl. de Fr.*, i. 76.

4 Sect. *Brassica* DC., *Syst. Veg.*, ii. 582.

5 REICHB., *Ic. Fl. Germ.*, ii. t. 91–98.

6 PRESL., *Fl. Sic.*, i. 92.

7 REICHB., *op. cit.*, t. 89.—WALP., *Rep.*, 187; v. 49.

8 *Sinapis incana* L., *Amœn.*, iv. 281; *Spec.*, 934.—*Erucastrum incanum* KOCH, *Syn.*, ed. 1, 56.—*Myagrum hispanicum* L., *Spec.*, 893.—*Hirschfeldia adpressa* MŒNCH.

Hirschfeldia,[1] the vegetative organs are more or less hoary, and the valves of the fruit, which is here shorter than in *Brassica* generally, have a dorsal rib and anastomosing veins; the siliqua ends in an oval beak, and contains a few ovoidal seeds. Thus this plant stands between the other species of *Brassica* and *B. nigra*[2] (Black Mustard, figs. 235, 236), which has been made a distinct genus under the name of *Melanosinapis*.[3] This plant has sessile or very shortly stipitate capsules, erect and more or less closely applied to the axis of the inflorescence; the valves have a carinate midrib. The other Mustards,[4] inseparable from the genus *Brassica*, are all characterized by a sessile siliqua, subterete or tetragonal, with an often short rostrum, and containing one or several globular seeds, or else aspermous. They are also European and Asiatic herbs.[5]

Brassica (Melanosinapis) nigra (Black mustard).

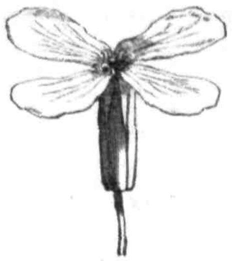

FIG. 235. Flower.

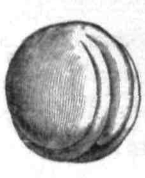

FIG. 236. Embryo ($\frac{8}{1}$).

The White Mustard[6] (fig. 237) has a fruit exceptional in the details from its form and size. Hence it has been made into the genus *Leucosinapis*,[7] which we also regard as a mere section of the genus *Brassica*. Its fruits are very spreading, oblong, mammillated and prickly, with three prominent anastomosing ribs on each valve; they contain few seeds, and are surmounted by a decurrent rostrum longer than themselves, tapering only at the apex, and usually a little falciform.

Brassica (Leucosinapis) alba (White mustard).

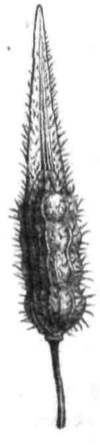

FIG. 237. Fruit.

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[1] MŒNCH, *Meth.*, 264

[2] KOCH, *Deutsch. Fl.*, v. 713.—GR. & GODR., *Fl. de Fr.*, i. 77.—*Sinapis nigra* L., *Spec.*, 933.—*S. incana* THUILL., *Fl. Par.*, 343.—*S. torulosa* PERS.—*S. turgida* PERS.—*S. villosa* MR.

[3] *M. communis* SPENN., *Fl. Friburg.* (ex SPACH, *Suit. à Buffon*, vi. 377).

[4] L., *Gen.*, n. 821.—REICHB., *Ic. Fl. Germ.*, ii. t. 85-88.—DC., *Prodr.*, i. 217.—*Bonnania* PRESL, *Fl. Sic.*, i. 99.—*Napus* SCHIMP. & SPENN., ex KOCH, *Syn. Fl. Germ.*, 55; ed. 2, 60 (ex B. H., *Gen.*, 967, n. 77).

[5] GREN. & GODR., *Fl. de Fr.*, i. 72.—WALP., *Rep.*, i. 186; *Ann.*, i. 49; vii. 149.

[6] *Sinapis alba* L., *Spec.*, 733.—DC., *Fl. Fr.*, iv. 645.—GREN. & GODR., *Fl. de Fr.*, i. 74.—*S. foliata* W.—*Napus Leucosinapis* SPENN.—*Leucosinapis alba* SPACH.

[7] SPACH, *Suit. à Buffon*, vi. 348.

The Wild Mustard or Charlock[1] (Fr., *Séneve commun;* figs. 238–241) is another *Brassica,* which has been made into the genus *Sinapistrum*[2] because it has a caducous style like *Hirschfeldia,* from which it differs however in having nearly globular seeds. *Diplotaxis,*[3] has also been separated from *Brassica,* differing, as implied by the name, in having the seeds in two rows in each cell; but the character is far from constant in this group. It contains some twenty species from Europe, Asia, and Africa,[4] which, as they have the flower and vegetative organs of *Brassica,* can only form a section thereof.

Brassica (Sinapis) arvensis. (Charlock.)

FIG. 241.
Seed ($\frac{5}{1}$).

FIG. 239.
Fruit.

FIG. 238.
Inflorescence.

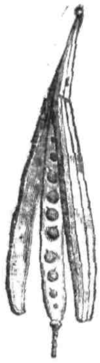

FIG. 240.
Dehiscent fruit.

Finally, *Sinapidendron*[5] includes frutescent species from Madeira, and the other islands off the West coast of Africa;[6] their siliqua is

[1] *Sinapis arvensis* L., *Spec.*, 933.—DC., *Fl. Fr.*, iv. 644.—GREN. & GODR., *Fl. de Fr.*, i. 73.—*Sinapistrum arvense* SPACH.

[2] SPACH, *Suit. à Buffon*, vi. 343.

[3] DC., *Syst. Veg.*, ii. 268; *Prodr.*, i. 221.—B. H., *Gen.*, 84, 967, n. 78.—*Pendulina* WILLK., in *Linnæa*, xxv. 2.

[4] REICHB., *Ic. Fl. Germ.*, ii. t. 81–84.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v 171.—BOISS., *Fl. Or.*, i. 387.—GREN. & GODR., *Fl. de Fr.*, i. 78.—WALP., *Rep.*, i. 187; v. 49; *Ann.*, i. 49; iv. 218; vii. 151.

[5] LOWE, *Pl. Madeir.*, 86.

[6] HOOK., *Icon.*, t. 571, 572.—WALP., *Rep.*, i. 184; *Ann.*, i. 147.

sessile, or with a short or somewhat elongated stalk; and its valves thus constituted[1] are nearly flat. *Brassica* comprises about a hundred species,[2] found in abundance in the temperate parts of Europe, Asia, and North Africa.

In the same sub-series we find six other genera; *Eruca, Savignya, Euzomodendron, Henophyton, Moricandia,* and *Orychophragmus,* which only differ in unimportant characters from *Brassica.*

II. RADISH SERIES.

The Radishes[3] (Fr., *Radis*; figs. 242, 243) have cruciferous flowers with the four sepals somewhat unequal, the two lateral being slightly saccate above the base, and four unguiculate petals. The stamens are free tetradynamous, with entire filaments. The elongated ovary is surmounted by a cylindrical style, with a concave stigmatiferous head emarginate at the apex. At first the ovary is one-celled, with two pluriovulate parietal placentas and a false septum, as in other Crucifers. But the fruit, elongated or cylindro-conoidal, continuous or moniliform, smooth or ribbed longitudinally, corky or spongy, is indehiscent, with the placentas, septum, and inner layers of the pericarp hypertrophied to fill the cavity with a pith-like substance excavated into alternate cells, which are separated from one another by partitions of this substance, and contain a descending subglobular seed, with a large fleshy embryo and conduplicate cotyledons. At the bottom of the fruit is often a cell separated by a transverse articulation, which is empty or contains a rudimentary seed. In *R. Raphanistrum,*[4] which is often made into a distinct genus, *Raphanistrum,*[5] there is moreover a transverse articulation between each seed (fig. 243), which is at maturity enclosed in a little achene-like joint,

---

[1] BRASSICA sect. 8.
1. *Eubrassica.*
2. *Erucastrum.*
3. *Hirschfeldia.*
4. *Melanosinapis.*
5. *Leucosinapis.*
6. *Sinapistrum.*
7. *Diplotaxis.*
8. *Sinapidendron.*

[2] WALP., *Rep.*, i. 184; ii. 763; *Ann.*, i. 48; ii. 53; iv. 216; vii. 147.

[3] *Raphanus* T., *Inst.*, 229, t. 114.—L., *Gen.*, n. 882.—ADANS., *Fam. des Pl.*, ii. 424.—J., *Gen.*, 238.—GÆRTN., *Fruct.*, ii. 299, t. 143, fig. 5.—DC., *Prodr.*, i. 228.—SPACH, *Suit. à Buffon*, vi. 333.—ENDL., *Gen.*, n. 4972.—PAYER, *Organog.*, 212, t. 44.—B. H., *Gen.*, 101, 968, n. 164.

[4] L., *Spec.*, 935.—GREN. & GODR., *Fl. de Fr.*, i. 72.—*R. sylvestris* LAMK.—*Rapistrum arvense* ALL.

[5] *R. Lampsana* GÆRTN., *loc. cit.*, fig. 6.—*R.*

Raphaneæ; but which divides transversely into two joints, one- or many-seeded, indehiscent or dehiscent, one-celled or divided into two

Crambe maritima (*Seakale*).

FIG. 249.
Flower, perianth removed ($\frac{4}{1}$).

FIG. 248.
Flower ($\frac{2}{1}$).

FIG. 250.
Long. sect. of flower.

FIG. 251.
Fruit.

FIG. 252.
Long. sect. of fruit ($\frac{2}{1}$).

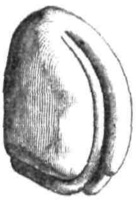

FIG. 253.
Embryo ($\frac{4}{1}$).

or more compartments by false-septa. The remaining genera of the

Erucaria aleppica.

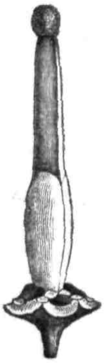

FIG. 255.
Gynæceum ($\frac{3}{1}$).

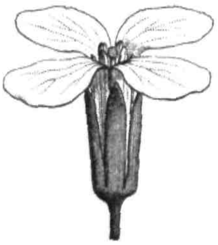

FIG. 254.
Flower.

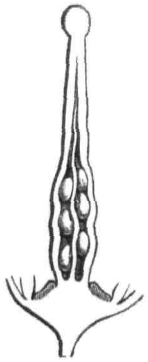

FIG. 256.
Long. sect. of gynæceum.

Cakileæ are *Enarthrocarpus*, *Rapistrum* (figs. 245–247), *Muricaria*, *Crambe* (figs. 248–253), *Hemicrambe*, *Physorhynchus*, *Fortuynia*, *Erucaria* (figs. 254–256), and *Moritzia*.

IV. WOAD SERIES.

Woad[1] (Fr., *Pastel*; figs. 257–262) has a cruciferous perianth and androceum, with the sepals equal at the base, and no teeth to the staminal filaments. The floral receptacle bears four glands superposed to the petals. The ovary is short, flattened from before backwards, so that the two placentas are nearly in contact. It contains one or more, rarely two descending ovules, and is surmounted by a little stigmatiferous head. The fruit is a silicule, oblong, oval, suborbiculate, or tapering into a wedge at its base, much flattened perpendicular to the placentas.[2] Its edges are thickened, or thinned off and almost foliaceous, while its swollen, hard or horny centre contains one seed (more rarely two superposed) suspended; the fleshy embryo has a superior radical in-

Isatis tinctoria (Dyers' Woad).

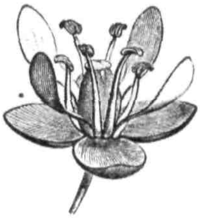

FIG. 257. Flower $(\frac{3}{1})$.

FIG. 259. Fruit $(\frac{2}{1})$.

FIG. 260. Open fruit.

FIG. 258. Long. sect. of flower.

Isatis hebecarpa.

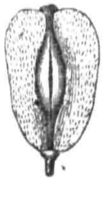

FIG. 261. Fruit.

FIG. 262. Dehiscent fruit.

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[1] *Isatis* T., *Inst.*, 211, t. 100.—L., *Gen.*, n. 824.—ADANS., *Fam. des Pl.*, ii. 423.—J., *Gen.*, 242.—DC., *Prodr.*, i. 210.—SPACH, *Suit. à Buffon*, vi. 573.—ENDL., *Gen.*, n. 4938.—B. H., *Gen.*, 94, n. 129 (incl.: *Chartoloma* BGE., *Sameraria* DESVX.).

[2] Prolonged into a leafy wing in *Sameraria* (DESVX., *Journ. Bot.*, iii. 161;—DELESS., *Ic.*

cumbent or more rarely accumbent[1] on the cotyledons. The fruit is indehiscent, or opens late by a vertical cleft separating the two car-

Myagrum perfoliatum.

FIG. 265.
Fruit.

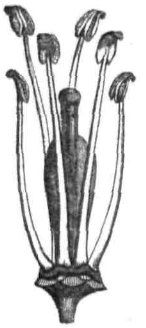

FIG. 263.
Flower (4/1).

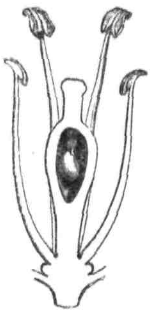

FIG. 264.
Long. sect. of flower.

FIG. 266.
Long. sect. of fruit.

pellary leaves. The genus Woad comprises annual or biennial herbs, with erect branching stems, and entire or subentire leaves, the cauline often sagittate. The flowers[2] form ramified ebracteate recemes. The fruits are borne on drooping pedicels. Some thirty species of this genus are known,[3] natives of Europe, Asia, and North Africa.

Sobolewskia lithophila.

FIG. 267.
lower, perianth removed.

The Woads have been made of late years the type of a series, *Isatideæ*, somewhat artificial, like most that have been made in this order, and containing twenty-four other genera. These have a usually short[4] fruit or indehiscent silicule, not articulated, often subdrupaceous before complete maturity, and then crustaceous or bony, winged or wingless, usually one-celled and one-seeded. Sometimes there are two seeds, or several one-seeded chambers. The characters of the seeds are of slight essential im-

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Sel., ii. t. 77 ;—JAUB. & SPACH, *Ill. Fl. Or.*, iii. t. 225), hence held the type of a distinct genus.

[1] Especially in *Chartoloma* (BGE., in *Bot. Zeit.*, ii. 249; *Enum. Pl. Lehm.*, 23, t. 3;—WALP., *Rep.*, v. 49; *Ann.*, iii. 823), which has also been made a distinct genus.

[2] Usually yellow.

[3] REICHB., *Ic. Fl. Germ.*, ii. t. 4.—DELESS., *Ic. Sel.*, ii. t. 77–79.—BOISS., *Fl. Or.*, i. 374 (*Sameraria*), 376.—GREN. & GODR., *Fl. de Fr.*, i. 138.—WALP., *Rep.*, i. 180; ii. 762; v. 44; *Ann.*, i. 46; ii. 52.

[4] The only exceptions are in certain species of *Sobolewskia* and *Spirorhynchus*.

portance, though often found of practical service. The genera are as follows: *Pachypterygium*, *Dipterygium*, *Tauscheria*, *Moriera*, *Cypleola*, *Thysanocarpus*, *Peltaria*, *Tchihatchewia*, *Tetrapterygium*, *Boreava*, *Calepina*, *Texiera*, *Schimpera*, *Myagrum* (figs. 263–266), *Sobolewskia* (fig. 267), *Spirorhynchus*, *Neslia*, *Palmstruckia*, *Euclidium*, *Ochthodium*, *Zilla*, *Cycloptychis*, *Boleum*, *Lachnoloma*, *Bunias* (figs. 268, 269), *Pyramidium*, *Octoceras*, and *Pugionium*.

Bunias (Lælia) orientalis.

FIG. 268. Flower without the perianth (⁸⁄₁).

FIG. 269. Long. sect. of flower.

V. LUNARIA SERIES.

Lunaria[1] (figs. 270, 271) has, like most of the Crucifers we have studied, four sepals[2] and four petals, both cruciate, six tetradynamous stamens,[3] a hypogynous disk, and a one-celled pluriovulate ovary divided by a false-septum into two chambers, and surmounted by a slender erect style whose apex is divided into two acute lobes. But the fruit is a *silicule*, that is, it is very broad[4] in proportion to its length, instead of being narrow and elongated. *Lunaria* is hence a *siliculose* Crucifer, to use the terms of the older botanists. The fruit is stipitate, elliptical or oblong, much compressed, parallel to the false-septum. Its valves are thin, membranous or chartaceous; they are only separated from the very thin translucent septum by the seeds and their elongated funicles which are sometimes partially adherent thereto.[5] The seed is edged by a membranous wing, and contains an embryo with leafy accumbent cotyledons. *Lunaria* comprises

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[1] *Lunaria* T., *Inst.*, 105, t. 218.—L., *Gen.*, n. 809.—ADANS., *Fam. des Pl.*, ii. 419.—J., *Gen.*, 239.—LAMK., *Dict.*, iii. 615; Suppl., iii. 514; *Ill.*, t. 561.—GÆRTN., *Fruct.*, ii. 288, t. 142.—DC., *Prodr.*, i. 156.—SPACH, *Suit. à Buffon*, vi. 456.—ENDL., *Gen.*, n. 4863.—B. H., *Gen.*, 71, n. 24.

[2] The lateral ones are gibbous at the base.

[3] The filaments of the shorter pair have a tooth in the sect. *Brachypus* (LEDEB., *Fl. Ross.*, i. 133).

[4] It must be at least as broad as it is long to deserve this name. According to A. P. DE CANDOLLE (*Théor. Elém.*, 386), "when the siliqua is short it receives the name of silicule (Lat., *silicula*); when its length is four times its breadth it is properly termed a siliqua."

[5] In *Brachypus*.

biennial or perennial herbs from Europe and Western Asia. Their organs are pubescent. Their leaves are alternate, entire, cordate. Their flowers[1] form axillary and terminal ebracteate racemes. Only two species are known,[2] pretty frequently cultivated in our gardens.

Lunaria biennis (*Honesty*).

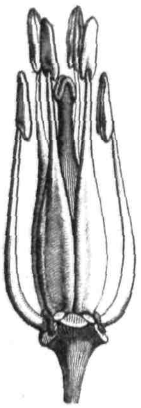

FIG. 270.
Flower, perianth removed ($\frac{4}{1}$).

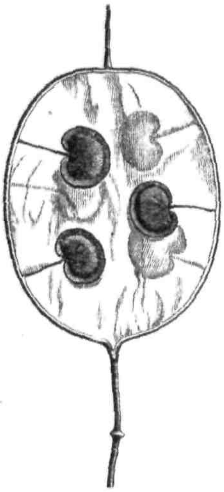

FIG. 271.
Fruit, valves removed.

ADANSON took *Lunaria* as the type of this series, characterized by its short siliqua, or silicule, flattened parallel to its septum; so that in all cases the breadth of the septum and of the valves are about the same. Owing to its breadth the seeds are often biseriate; which would seem to show that this arrangement of the seeds depends, not on the fundamental organization of the gynæceum and fruit, but on the breadth of the latter, allowing the seeds to retain the reciprocal arrangement that they possessed

Alyssum saxatile.

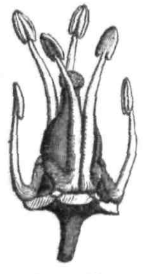

FIG. 273.
Flower, perianth removed ($\frac{6}{1}$).

FIG. 272.
Flower ($\frac{4}{1}$).

FIG. 274.
Long. sect. of flower, perianth removed.

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1 Lilac, or exceptionally whitish.

2 REICHB., *Ic. Fl. Germ.*, ii. 23. — GREN. & GODR., *Fl. de Fr.*, i. 112.—BOISS., *Fl. Or.*, 256.—WALP., *Ann.*, vii. 108.

originally as ovules; so that they are not forced as it were to penetrate the intervals in the opposite row, and apparently form at maturity a single vertical series. Hence it will be easily understood that one can ascribe no such intrinsic importance to this character

Cochlearia officinalis (*Scurvygrass*).

FIG. 275.
Flowering branch.

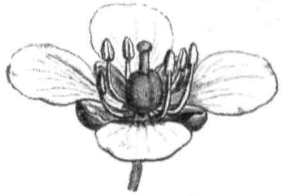

FIG. 276.
Flower ($\frac{4}{1}$).

FIG. 278.
Long. sect. of flower.

FIG. 277.
Diagram.

as would allow us to found tribes or series on it, for it has not even a generic or specific value within the series.

Among the numerous genera of this series some have the cotyledons usually accumbent, and hence would correspond to the *Arabidineæ* in *Cheirantheæ*. This is especially marked in *Alyssum* (figs.

272–274), which is hence made the type of the subseries *Alyssineæ*. It includes the fifteen genera *Lunaria, Farsetia, Selenia, Platyspermum, Alyssum, Alyssopsis, Draba, Stenonema, Odontocyclus, Cochlearia*

Cochlearia Armoracia (*Horseradish*).

FIG. 279.
Habit (1/8).

(figs. 275–279), *Pringlea, Vesicaria, Coluteocarpus, Aubrieta* (figs. 280–282), *Grællsia*, and *Buchingera*.

Camelina (fig. 283) is the type of a second subseries, *Camelineæ*, wherein the silicule, of variable form, has biseriate seeds, with, how-

ever, nearly always accumbent cotyledons. It includes nine other

Aubrieta deltoidea.

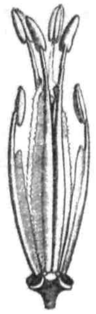

FIG. 281.
Flower, perianth removed ($\frac{4}{1}$).

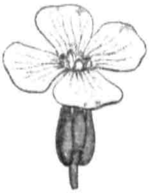

FIG. 280.
Flower ($\frac{2}{1}$).

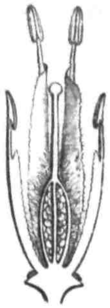

FIG. 282.
Long. sect. of flower.

genera: *Menkea, Sphærocardamum, Geococcus, Stenopetalum, Tropidocarpum, Blennodia, Mathewsia, Ammosperma*, and *Leptaleum*.

Finally we make a third subseries, as artificial as the two others of the genera, *Succovia, Pachycladon, Vella* (figs. 284, 285) and *Carrichtera*, which in flower and seed come very near the *Brassicineæ* in *Cheirantheæ*, but possess a short, didymous or subglobular fruit, and hence may be ranked in *Siliculosæ*, like *Alyssineæ* and *Camelineæ*.

Camelina sativa (*Gold of pleasure*).

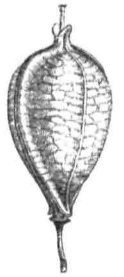

FIG. 283.
Fruit ($\frac{4}{1}$).

Vella pseudo-Cytisus.

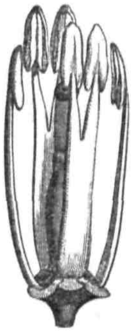

FIG. 284.
Flower, perianth removed ($\frac{5}{1}$).

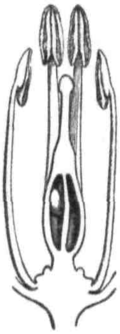

FIG. 285.
Long. sect. of flower.

VI. THLASPI SERIES.

Thlaspi[1] (fig. 286) has cruciferous flowers, with the sepals equal at the base, and the petals equal or subequal, obovate and shortly unguiculate. The stamens are tetradynamous, with a disk of four

[1] DILLEN, *Giess.*, 123, t. 6.—T., *Inst.*, 212 (part.).—L., *Gen.*, n. 802.—ADANS., *Fam. des Pl.*, ii. 421.—J., *Gen.*, 241.—DC., *Prodr.*, i. 175.—ENDL., *Gen.*, n. 4885.— HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 176.—B. H., *Gen.*, 91, 967, n. 116.

chinsia, Redowskia, Synthlipsis, Lyrocarpa, Biscutella (fig. 296), *Brossardia, Heldreichia, Megacarpæa, Cremolobus,* and *Didymophysa.*

Biscutella auriculata.

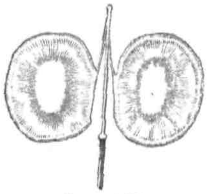

FIG. 296.
Fruit ($\frac{2}{1}$).

Lepidium sativum (*Garden cress*).

FIG. 297.
Fruit ($\frac{2}{1}$).

The Cresses or Pepperworts (Fr., *Passerage*; fig. 297) head a second subseries in this order, distinguished from the first by possessing incumbent or more rarely conduplicate cotyledons. So from the generic name *Lepidium* we get that of the subseries *Lepidineæ,* which contains twenty-one other genera: *Hymenophysa, Brachycarpæa, Stroganowia, Physalidium* (?), *Coronopus* (figs. 298, 299), *Ionopsidium, Noccæa, Capsella* (figs. 304, 305), *Mancoa,*

Coronopus Ruellii.

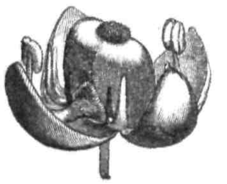

FIG. 298.
Flower ($\frac{4}{1}$).

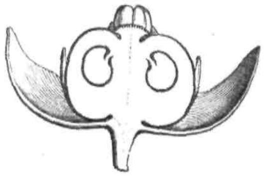

FIG. 299.
Long. sect. of flower.

Notothlaspi, Schouwia, Psychine (fig. 306), *Dilophia, Stubendorfia, Eunomia, Æthionema* (figs. 300–303), *Bivonæa, Campyloptera, Menonvillea* (fig. 307), *Hexaptera* and *Decaptera.* All these are most closely related to one another and to *Lepidium.* They differ mainly, in the first place, in the form of the valves. These are sometimes wingless, sometimes with a marginal or dorsal wing; in the last case the fruit is laterally compressed. In the three last genera only the fruit is subdehiscent, and the valves bear lateral wings. The next variation

Æthionema coridifolium.

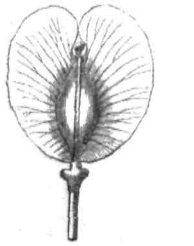

FIG. 300.
Fruit.

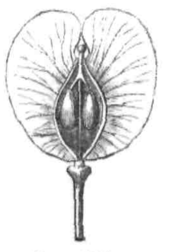

FIG. 301.
Long. sect. of fruit.

is in the form of the silicule, which may be elliptical, oblong, globular, didymous, cordiform, obcuneiform, or cymbiform; the valves may be flat, compressed, convex, navicular, carinate, bearing a double dorsal crest, or even four, six, or ten wings, as in the genera *Menonvillea*, *Hexaptera*, and *Decaptera*. The number of ribs on the valves is also of some use in distinguishing these genera. Next come the vegetative organs, the leaves, the inflorescence. Some genera are herbaceous; others, like *Brachycarpæa*, are suffrutescent. *Noccæa* comprises scapigerous herbs. The leaves are linear entire in *Brachycarpæa*; the cauline ones are auriculate in *Campyloptera* and *Schouwia*. They are all opposite in *Eunomia*; but this is the case with the inferior ones only in *Æthionema* proper. All are pinnatifid in certain species of *Hexaptera*, pinnatisect in *Noccæa*. The inflorescence is in form racemose in most of the genera, corymbose in *Mancoa*. *Physalidium* has the leaves of certain Saxifrages; and in this, like the other series, such a cha-

Æthionema membranaceum.

FIG. 302.
Fruit dehiscing.

Æthionema cristatum.

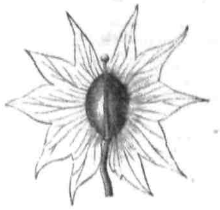

FIG. 303.
Fruit.

Capsella Bursa-pastoris (*Shepherd's purse*).

FIG. 304.
Habit (½).

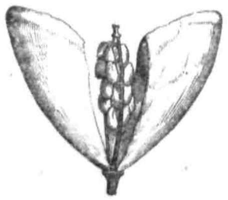

FIG. 305.
Fruit (2/1.)

Psychine stylosa.

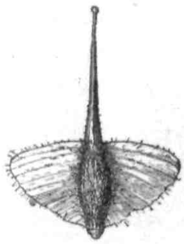

FIG. 306.
Young fruit (3/2).

racter, elsewhere of only specific value, is sufficient at times to distinguish genera.

Menonvillea linearis.

FIG. 307.
Fruit dehiscing ($\frac{2}{1}$).

Lepidium comprises herbs and undershrubs, glabrous or pubescent, with alternate leaves and racemose flowers. Sixty or seventy species are known, inhabiting the warm and temperate regions of the whole world, but not Alpine or Arctic. These species are grouped into sections,[1] based on the form of the siliqua valves and style.

VII. SUBULARIA SERIES.

Awlwort[2] (Fr., *Subulaire ;* figs. 308–310) has regular hermaphrodite flowers. The receptacle forms a deep cup, in the bottom of which is inserted the gynæceum, while the perianth and androceum are

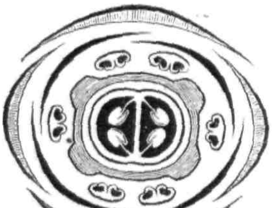

FIG. 309.
Diagram.

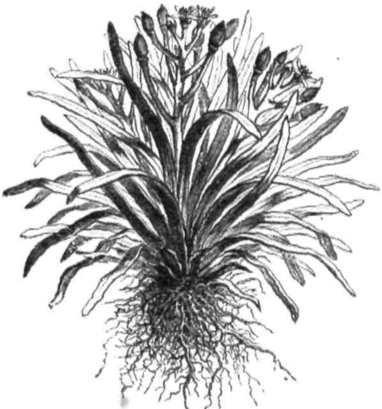

FIG. 308.
Habit.

FIG. 310.
Long. sect. of flower ($\frac{6}{1}$).

borne on the rim, and are hence distinctly perigynous. The calyx is formed of four free subequal sessile sepals, all similar at the base,

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[1] See the *Genera* below.

[2] *Subularia* L., *Gen.*, n. 799.—J., *Gen.*, 240.—ENDL., n. 4977.—DC., *Prodr.*, i. 235.—A. GRAY, *Gen. Ill.*, t. 71.—B. H., *Gen.*, 83, n. 76.—H. BN., in *Adansonia*, x. 45, t. 6.

imbricate-decussate in the bud. The alternating cruciate petals are sessile, riband-shaped, elongating with the growth of the flower, imbricate in the bud. The androceum is formed as in *Cruciferæ* generally, of six tetradynamous stamens, the two lateral a little shorter than the rest. Each consists of a free filament, and an introrse two-celled anther, of longitudinal dehiscence. The concavity of the receptacle is lined by a thin layer of glandular tissue, which is thickened in a circle towards the rim of the receptacle. There the disk is prolonged in front of each petal into a prominent truncate lobe. The gynæceum is free; it consists of an ovary like that of most Crucifers, tapering above into a very short style, whose scarcely dilated obtuse apex is covered with stigmatic papillæ. Each half-cell of the ovary contains from two to six descending campylotropous ovules. The fruit, accompanied at its base by the remains of the receptacular sac, is a turgid silicule, ovoid, ellipsoid, oblong, or sub-globular. It contains from two to six or eight descending seeds, formed as in *Cruciferæ* generally, containing a very bowed embryo, whose ascending radicle is as broad as the accumbent cotyledons or even broader. Two species of *Subularia* are known, little herbaceous annuals; one inhabits mountain-lakes in Europe, Asia, and North America;[1] the other has a similar habitat in Abyssinia.[2] Their leaves are alternate, all radical, narrow, elongated subulate, in form like those of a Monocotyledon. The flowers[3] form ebracteate racemes (?), terminating a lateral axis, and simple or slightly ramified.

The Crucifers have long been known as forming a most natural group in similarity of fruit, corolla, and androceum. Ray,[4] in 1682, noticed them as uniform *Tetrapetalæ* and as *Siliquosæ*. Herein he was closely followed by Magnolius,[5] who in 1689 classed them as *Siliquosæ*, in the plants of his seventh section (tetrapetalous), and by P. Hermann,[6] whose Class XI. consists of herbaceous siliquose plants. Tournefort,[7] in 1694, resting chiefly on the cruciform corolla, united

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[1] *S. aquatica* L., *Spec.*, 896.

[2] *S. monticola* A. Br., in *Schweinf. Beitr. z. Fl. Æthiop.*—Schweinf., *Ic. Lith.*

[3] Small, with a whitish corolla.

[4] *Meth. Nat. Pl.*; *Hist.*, xvi. 777.

[5] *Fam. Pl. per Tab. Disp.*, in *Prodr. Hist. Gen. Pl.*

[6] *Fl. Lugd.-Bat.* (1690).

[7] *Isagoge*; *Inst.* 210 (1700).

these plants into Class V. of his great work, comprising plants with a regularly cruciate corolla. LINNÆUS distinguished them both as *Siliquosæ*[1] and as *Tetradynameæ*,[2] thus bringing into the definition of the group the character of the inequality of the six stamens. CRANTZ,[3] dwelling rather on their uniformity in medicinal qualities, named them *Antiscorbuticæ*. DE JUSSIEU[4] retained the name *Siliquosæ* for his family (35); HALLER[5] changed it to *Cruciatæ*. The name *Cruciferæ* was finally adopted by ADANSON[6] in 1763, and after him by A. L. DE JUSSIEU.[7] It is under this name that the order has been made the object of the special work of many celebrated botanists of this century. A. P. DE CANDOLLE[8] and R. BROWN[9] stand in the first place. DESVAUX[10] and KUNTH[11] also gave it special attention. ENDLICHER[12] and LINDLEY[13] in their general works collected the immense mass of matter on the organization of the *Cruciferæ* that had been accumulated by their predecessors, at the same time modifying it to some extent. In 1857 J. PAYER[14] studied the organogeny of the flower, thus solving most of the contested questions as regards its symmetry.[15] In recent years J. HOOKER undertook, with the assistance of his colleagues,[16] the very intricate study of this order, for his *Genera Plantarum*,[17] wherein the number of genera is fixed at one hundred and seventy-three. We have reduced this number by ten, not to mention those which are utterly doubtful.[18]

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[1] *Prælect.*, ed. *Gies.*, 481.

[2] *Gen.*, 329.

[3] *Fl. Austr.*, 1.

[4] EX ADANS., *Fam. des Pl.*, éd. 2, 35; in A. L. JUSS., *Gen.*, lxvii.

[5] *Helv.*, i. 192.

[6] *Fam. des Pl.*, ii. 16, 409.

[7] *Gen. Pl.*, 237 (1789).

[8] In *Mém. Mus.*, vii. 169; *Syst. Veg.*, ii. (1822), 139; *Prodr.*, i. (1824), 131. (Illustr. in the *Icon. Deless.* ii.), from which we have taken figs. 206, 245–247, 261, 262, 265–267, 300–303, 306, 307.)

[9] In *Ait. Hort. Kew.*, ed. 2 (1812), iv. 71; in *Denh. & Clappert. Narr.* (1824), 210.

[10] *Journ. Bot.*, iii. (1813), 145.

[11] In *Verh. Berlin. Acad.* (1832), 33; *Die Bl. und Fr. d. Crucif.*, Berlin (1833).

[12] *Gen.* (1836–40), 861, Ord. CLXXXI.

[13] *Veg. Kingd.* (1846), 351, Ord. CXXIII. *Brassicaceæ*.

[14] *Tr. d'Org. Comp. de la Fleur*, 209, t. 44.

[15] These have been chiefly investigated in the following works:—R. BR., *loc. cit.*—DC., *Mém. sur la Fam. des Crucifères* (Paris, 1821).—HOWELL, in *Ann. Nat. Hist.*, x. 254.—LINDL., *Veg. Kingd.*, 352.—SER., in *Bull. Bot. de Gen.* (1830), 112.—A. S. H. & MOQ., in *Ann. Sc. Nat.*, sér. 1, xx. 318.—MOQ. & WEBB, in *Mém. Acad. Toul.*, v. 364.—KRAUSE, in *Bot. Zeit.*, iv. 142.—DUCH., in *Rev. Bot.*, ii. 207.—SCHIMP., in *Mém. Congr. Sc. de Fr.* (1843), 62.—CHAT., in *Bull. Soc. Bot. de Fr.*, viii. 370.—CLARKE, in *Seem. Journ. of Bot.* (1865), 5.—GODR., in *Ann. Sc. Nat.*, sér. 5, ii. 288.—EICHL., in *Mart. Fl. Bras.*, *Crucif.*, 330, t. 68.

[16] THOMSON, in vol. v. (129) of the *Journ. of the Linn. Soc.* (*Præc. ad Fl. Ind.*), & BENTHAM, for the *Genera* (57, 965).

[17] It will be seen that we have based our study on the result of these researches, which are, for all that may be said to the contrary, the best that have been as yet produced on this difficult group, and certainly those in which the best use has been made of all previous works.

[18] 1. *Agallis* (PHILIPP., in *Linnæa*, xxxiii. 12),

All Crucifers have certain common constant characters: the quaternary perianth; the cruciate sepals and petals, with the latter free and imbricate; the non-adherent gynæceum;[1] its normally binary structure, with the carpellary leaves united into a really one-celled ovary with parietal placentation,[2] the cavity being at first undivided;[3] finally, the indefinite inflorescence.

Next to these absolute (?) characters come others, which are all but constant, with single or very few exceptions, viz.: the convex receptacle, with hypogynous insertion, except in one genus;[4] the definite androceum, hexandrous and tetradynamous (polyandry occurs in one species;[5] there are fewer than six stamens in certain cases of reduction[6]); the absence of albumen in the seeds; the inflexion of the embryo; the alternation of the leaves; the absence of stipules at their base;[7] the absence of bracts where the floral pedicels spring from the axis of the inflorescence.[8]

The characters of frequent variation differ in occurring in most of the organs both of vegetation and reproduction. We may enumerate them:—

1. The root may be fibrous or fascicled, or a tap-root. In the latter case it becomes the seat of the deposit of a quantity of nutritive matter; and is then edible, as in the Turnip, Radish, &c.

2. The stems vary in duration; they are usually herbaceous, whether annual or perennial.[9] They are rarely frutescent; still more rarely climbing, as in *Cremolobus*. Sometimes they have a creeping rhizome, covered with scales representing rudimentary leaves.[10]

3. The leaves are generally alternate; but in *Dentaria* they are

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a very ill-known Chilian plant;—2. *Discovium* (RAFIN., ex DC., *Prodr.*, i. 120);—3. *Halimolobos* (TAUSCH, in *Flora*, 1836, 410), whereof the same may be said; — 4. *Microstigma* TRAUTV., ex LINDL., *Veg. Kingd.*, 335b), whose name alone is published.

1 Even in *Subularia*, where the receptacle is concave, the ovary is not at all adherent to it.

2 The placentations that have been described as basilar or apical, are so only in appearance when adult. At first they are really parietal placentas, reduced to the short portion near their base or apex. (See p. 215, n. 13.)

3 The production of the false septum is always late.

4 *Subularia*.

5 *Megacarpea polyandra* DC.

6 See p. 215, n. 12.

7 That is, of well-developed stipules when they are adult. (See p. 212, n. 4.)

8 For the exceptions see p. 212, n. 7.

9 Spinescent in certain species.

10 The anatomical structure of the stem has been chiefly studied by HARTIG (in *Bot. Zeit.*, 1859, 109), in *Arabis*, and by HANSTEIN (in *Pringsh. Jarhb.*, i. 231), who has traced the connexion of the arrangement of the leaves with that of the fibro-vascular bundles in the stem (OLIV., *Stems in Dicot.*, 6; in *Nat. Hist. Rev.*, ii. 303). The aerial axes of certain species of *Dentaria* (*D. bulbifera* L., &c.), bear axillary bulbils.

error as to their true origin. But this appears to us impossible when the receptacle is cup-shaped as in the Awlworts;[1] for then, just as in *Rhamnaceæ*, *Rosaceæ*, *Leguminosæ*, &c., the whole inside of the cup is lined by a thin layer which forms a circular rim at the edge, only dilated into four little lobes between the sepals. In the hypogynous *Greggia* the disk is also annular, and simply lobed on the rim. In *Selenia*, though the flower is tetramerous, it is divided into ten hypogynous lobes. Probably some use might be made in classification of the characters of the disk, which it is pretty easy to make out in the fresh flower. But from its very origin,[2] it usually becomes diffluent and indistinct in herbarium flowers softened by soaking: so that no practical use can be made of these characters.

10. Of the four sepals, the two lateral may or may not be equal in length and breadth to the antero-posterior. They are usually alternative-imbricate in præfloration, rarely valvate or subvalvate, as in *Savignya*, *Ricotia*, &c. The greatest dissimilarity in about half the cases usually lies in the insertion. In *Brassica*, for instance, the insertion of all four sepals is such that their scar on the receptacle forms a moderately curved arc. In *Cheiranthus*, &c., this is the case with the anterior and posterior only; the two lateral are inserted along a horseshoe, with more or less divergent branches. Hence at the base of these sepals is a gibbosity, a sac of variable depth, or an obtuse spur, sometimes very prominent like that of *Dicentra*. This character varies but little within any genus. When the spur is well developed the corresponding gland grows large and projects within its cavity. A rudimentary formation of this kind occurs very rarely in the other sepals.

11. The petals vary: in the presence or absence of a claw; in the form of the limb, which may be entire, emarginate, bilobate, or even plurilobate or pinnatifid, as in *Dryopetalum* and *Schizopetalon*; and in the mode of imbrication in the bud. The corolla is generally regular; but the anterior petals are much more developed than the posterior in *Iberis*, which is thus alone distinguished from *Thlaspi*. Apetalous flowers occur pretty frequently in certain species of *Capsella*, *Coronopus*, *Cochlearia*, *Cardamine*, *Lepidium*, *Nasturtium*, &c.

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[1] See *Adansonia*, x. 47.

[2] "They only appear very long after the pistil, and are, as ADANSON thought, only swollen parts of the receptacle, either above or below the insertion of the stamens." (PAYER, *Organog.*, 214.)

12. The stamens are indefinite in one genus only, *Megacarpæa*. There are in other cases six, tetradynamous; very rarely are the two lateral scarcely shorter than the four others. But sometimes some or all of them disappear; this occurs in *Capsella*, *Lepidium*, *Nasturtium*, and *Coronopus*. Four out of the six stamens, the large ones, may even disappear; or their filaments are reduced to tongues, sometimes surmounted by a glandular dilatation. The staminal filaments are all free; or else the four longer are united in pairs to a variable height, as in certain species of *Vella*, *Sterigma*, *Anchonium*, *Boleum*, *Dontostemon*, *Zerdana*, *Hexaptera*, *Æthionema*, *Euzomodendron*, *Leptaleum*, *Myagrum*, *Spirorhynchus*, &c. The base of the filament is sometimes as it were articulated. It is here very contracted, but above may expand into a circular rim or unilateral scale, or still higher up, it becomes spreading, bowed, or angular, or is prolonged laterally into a tooth or appendage, even a sort of wing in *Lepidostemon*. This character is variable from species to species within a genus. The anther varies in form and colour; though usually introrse and 2-celled, that of the large stamens is 1-celled in *Atelanthera*. Sometimes the form is a little different in the two sets of stamens.

13. The ovary varies in form, nearly in the same way as the fruit, and may bear the same prominences as we shall see thereon. It often tapers into a more or less elongated style, sometimes laterally dilated near the base (as in certain *Matthiolas*) into horns; these may occur lower on the gynæceum or fruit, as in *Lonchophora*, *Pyramidium*, &c. The stigmatiferous apex is usually swollen, entire, or very variably divided into connate, approximated, or divergent lobes or horns. Pretty often there is no style and the stigma is sessile on top of the ovary. This is normally formed of two lateral carpellary leaves, and two alternating parietal placentas.[1] But one of the latter may become in time quite abortive or be reduced to its lower part, and bear no ovules; and the other one may bear but one or few ovules in only its upper or lower part. Thus the ovule and seed appear suspended or erect, as the case may be. The ovules are in form usually more or less campylotropous; but some possess a raphe of variable development, and cannot be distinguished from ordinary anatropous ovules.

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[1] We have seen that the cases of three or four carpels and placentas must be held anomalous, especially in *Tetrapoma* (p. 184, note 4, figs. 210–213).

14. The fruit of the Crucifers is termed *siliqua* or *silicule* according as it is long or short.[1] To really deserve these names it must be dry and dehisce longitudinally. But often it does not open, or separates transversely into one- or many-seeded joints. It is then usually not quite dry during the days before maturity. A woody or even bony stone may be distinguished, surrounded by a thin layer of fleshy or suberous mesocarp, which later on dries leaving the fruit "nucamentaceous." The true siliqua or silicule dehisces into three parts, (*a*) a frame (Fr., *cadre*) or replum, corresponding to the placentas, whereon is stretched a false septum springing from them,[2] complete, or incomplete and perforated, fenestrated, or even reduced to its edges, membranous and translucent, even or veined,[3] or rarely thick and rigid, dividing the ovary and fruit into two lateral half- or false-cells; (*b*) two lateral valves, varying in form like the siliqua, nearly flat or more or less tumid gibbous or carinate, smooth wrinkled or muricate externally, without visible veins, or with a midrib and lateral veins of variable prominence, either free or connected by simple or anastomosing venules. All these details generally vary from genus to genus. The apex of the fruit may present prominences of diverse origin. Two correspond with and prolong the placentas; they may be simple, or bifurcated as in *Parolinia*. Others alternating with these correspond with the apices of the carpellary leaves. And some answer to a variable projection of the back of the valves, as in *Tetracme* or *Anastatica*, and form points, or scales more or less dilated transversely. It will be seen below that the most important character is taken from the general form of the cross section of the fruit, according as its breadth is the same in all directions, or compressed parallel with or perpendicular to the septum. Its edges are then often more or less turned off, and keeled or with entire, incised, or even fenestrated wings, as in *Thysanocarpus*. The apex of the fruit may be obtuse or prolonged into a beak formed by the style or its persistent base; and this beak may remain attached or fall off at the base; a character which may be used in the distinction of genera or subgenera.[4]

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[1] See p. 199, note 4.

[2] See PAYER, *Organog.*, 212.

[3] It is formed of one or more nearly parallel layers of cells, with peculiar elongated fibres superadded in certain cases. (FOURN., in *Bull. Soc. Bot. de Fr.*, xi. 237, 238.)

[4] The fruits of *Morisia* and *Geococcus* are peculiar in ripening under ground.

15. The number of seeds varies from one or two to fifty and upwards. Sometimes subbasilar or subapical, descending or ascending, they are attached by a funicle of variable thickness, which may be quite free, or remain adherent for a very variable extent to the false septum. There are three seed-coats; the inner membranous; the middle, more or less testaceous, often prolonged into a wing; the superficial, often thin and epidermoid, whose cells often swell up in water into a thick layer of mucilage, as in the Mustards, &c. The presence of a thin layer of albumen is exceptional; the embryo usually fills the seed-cavity. Frequently when the fruit is broad there are two rows of seeds in each false cell, while in narrow elongated fruits there is but one. However this point, on which great stress has been laid in classification, may vary from species to species in a single genus, and even from siliqua to siliqua on a single individual.[1]

16. The embryo is an organ to which the highest importance has been ascribed in the classification of this order. Its radicle, often ascending,[2] is usually folded on the cotyledons.[3] If these are flat and it is applied to their commissure they are termed *accumbent*;[4] if it lies on the back of one of them they are termed *incumbent*.[5] Or the cotyledons are *conduplicate*,[6] folded across one inside of the other, with the radicle inside the groove between the two halves of the former. Or they may be *biplicate*,[7] or folded twice transversely; or else coiled in a spiral.[8] In intermediate positions the radicle is more or less oblique. Moreover, the cotyledons may be entire, emarginate, bilobate, or bifid, as in *Schizopetalon*.

Which then of these variable characters have been used by botanists in their subdivision of this order? First the form of the fruit. LINNÆUS and his followers divided *Cruciferæ* into *Siliquosæ* and *Siliculosæ*; and so did A. L. DE JUSSIEU in his *Genera Plantarum*. ADANSON went much further in his *Familles des Plantes*. He more skilfully distinguished the form of siliqua that dehisces longitudinally, from that which is lomentaceous and divides across, and

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1 See WEDD., *Chlor. Andina*, i. t. 85.—J. GAY, in *Bull. Soc. Bot. de Fr.*, x. 9.

2 "Radiculam sæpe ascendentem a placenta remotam." (B. H., *Gen.*, 57.)

3 Straight in *Leavenworthia*.

4 E.g.: *Arabis, Matthiola, Cheiranthus, Nasturtium, Cardamine, Lunaria, Vesicaria*, &c.

5 *Hesperis, Sisymbrium, Erysimum*, &c.

6 *Brassica, Moricandia, Succowia, Eruca, Crambe, Rapistrum, Raphanus*, &c.

7 *Heliophila, Chamira*, &c.

8 *Bunias, Erucaria*, &c.

that which, indehiscent and one-seeded, resembles an achene at maturity. In the silicule he saw that one form is flattened parallel to the broad septum, the other perpendicular to a long narrow septum. Hence he makes four sections—1. *Roquettes* (Rockets), whose fruit is a siliqua of longitudinal dehiscence; 2. *Lunaires*, whose fruit is a silicule with valves parallel to the septum; 3. *Thlaspis*, with the valves of the silicule perpendicular to the septum; 4. *Raiforts* (Radishes) with achenes, or elongated fruits with either one-seeded joints, or chambers in two lateral vertical rows.

For these characters, which are very satisfactory, and, if not absolute, subject to but few exceptions, A. P. DE CANDOLLE preferred to substitute those derived from the relative position of the radicle and cotyledon; and divided *Cruciferæ* into four suborders: 1. *Pleurorhizeæ*, with accumbent cotyledons; 2. *Notorhizeæ*, with incumbent cotyledons; 3. *Orthoploceæ*, with them conduplicate; 4. *Spirolobeæ*, with them spiral; 5. *Diplecolobeæ*, with them biplicate. To this procedure grave objections have been made.[1] We ourselves are convinced that in so natural an order hardly any absolute characters can be found; while to classify it (artificially after all is said) it is well to put in the first place the least inconstant characters, and those of easiest practical application; and hence we fall back in principle upon ADANSON's scheme, modifying it by the admission of the new tribes subsequently added.[2] We thus form seven series. One alone is characterized by a concave receptacle and a perigynous flower. The others comprise the hypogynous Crucifers, with a convex receptacle. These again fall into *Siliquosæ* and *Siliculosæ*. The former are divided into three series, according as the fruit is longitudinally dehiscent, indehiscent, or transversely divided. Next come the three Siliculose series in which the fruit is respectively indehiscent, compressed parallel to the broad septum, compressed at right angles to the narrow septum. These series are:

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[1] See *Bull. Soc. Bot. de Fr.*, vii. 252; ix. 536.—PAYER, *Leç. sur les Fam. Nat.*, 140. The cases where accumbency and incumbency occur in one and the same genus are very numerous. Still more so are those of obliquity of the radicle in every degree.

[2] We have already said what use we have made of the results obtained by J. HOOKER, which, though they too have met with criticism (FOURN., in *Bull. Soc. Bot. de Fr.*, x. 449), are the most satisfactory we have met with.

a. *Cruciferæ hypogynæ.*

1. *Cheirantheæ.*—Siliqua dehiscent longitudinally.
2. *Raphaneæ.*—Fruit elongated, (usually) indehiscent.
3. *Cakileæ.*—Fruit elongated, more rarely short, lomentaceous.
4. *Isatideæ.*—Silicule inarticulate, indehiscent.
5. *Lunarieæ.*—Silicule dehiscent, compressed parallel to the septum.[1]
6. *Thlaspideæ.*—Silicule dehiscent, compressed at right angles to the septum.[2]

b. *Cruciferæ perigynæ.*

7. *Subulariæ.*—Silicule turgid.

Next we use for the formation of subseries the less constant and easy character of the relations of the radicle and cotyledons, and we shall thus found in certain of these series secondary divisions which though far less absolute in their limits, may yet have great practical utility. Thus we divide the *Cheirantheæ* into three subseries as follows :—

CHEIRANTHEÆ.
1. *Arabidineæ.*—Cotyledons (usually)[3] accumbent.
2. *Sisymbrineæ.*—Cotyledons incumbent.
3. *Brassicineæ.*—Cotyledons conduplicate.

So also with *Lunarieæ* :—

LUNARIÆ.
1. *Alyssinæ.*—Cotyledons (usually) accumbent.
2. *Camelineæ.*—Cotyledons incumbent.
3. *Succovineæ.*—Cotyledons induplicate.

And *Thlaspideæ* :—

THLASPIDEÆ.
1. *Iberidineæ.*—Cotyledons (usually accumbent).
2. *Lepidineæ.*—Cotyledons incumbent (or conduplicate).

The other series are more homogeneous, and remain undivided. The genera will be distinguished below by characters of the third grade, such as those of the insertion of the sepals; the details of the androceum and of the gynæceum, including ovary, septum, style and stigma, and the fruit, seeds, funicle, &c.

The affinities of *Cruciferæ* have long been recognised.[4] The order contains none of those types with free carpels which occur in

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[1] Even when the compression is ill marked the breadth of the septum remains always nearly equal to that of the valves.

[2] Which is always narrower than the valves.

[3] We have elsewhere dwelt (see p. 218, note 1), on every opportunity, on the exceptions, which are daily increasing in number. BENTHAM and HOOKER give them at the head of each secondary group.

[4] MIRB., in *Ann. Sc. Nat.*, sér. 1, vi. 266.—

Papaveraceæ, and link it so well with *Ranunculaceæ*. But it is undoubted that *Cruciferæ* come next to *Papaveraceæ* on the one hand and *Capparidaceæ* and *Resedaceæ* on the other; so that if the sum total of natural affinities be considered they must be placed between these three orders. They differ from all of them in the distinctly cruciform perianth and generally definite tetradynamous anthers, no less than in the structure of the fruit and seed. To distinguish the tetradynamous *Capparidaceæ* with dry dicarpellary fruit, the only characters are the unsymmetrical flowers, the habit, the 1–3-foliolate leaves, and the absence of a false septum in the fruit. *Resedaceæ* are separated by their indefinite unilateral androceum and the structure of their fruit. Certain types of *Papaveraceæ* approach so close to *Cruciferæ* that they can only be distinguished by their indefinite androceum (*Fumarieæ* are an exception to this), when their fruit becomes dicarpellary, very much like a siliqua, and with a false septum comparable to that of a Crucifer. Then the only difference lies in the type of the flowers, quaternary in this order, but ternary in Papaverads or repeatedly binary with a double or triple corolla of dimerous verticils, not of a single tetramerous whorl. Finally the embryo of *Papaveraceæ* is always accompanied by an albumen much larger than itself.

The geographical distribution of this order would alone suffice for a great work. Of one hundred and sixty-three genera retained by us in this order, twenty-two are confined to America; seventeen are common to both Worlds, and a hundred and twenty-four are only found in the Old World. Of the species some authors have raised the number to upwards of two thousand: we admit some thirteen hundred, whereof six hundred and seventy belong to the Old World genera, and eighty-four to the American; of the remaining five hundred and forty-seven, belonging to the genera common to both Worlds, not more than a tenth part are American, so that the sum total of the species in the New World is about one hundred and forty against some eleven hundred and sixty in the Old. Next comes the question of latitude.

BERNH., in *Linnæa*, viii. 401; in *Ann. Sc. Nat.*, sér. 2, iii. 357.—J. GAY, in *Ann. Sc. Nat.*, sér. 2, xviii. 218.—ENDL., *Enchirid.*, 452.—LINDL., *Veg. Kingd.*, 351.—J. G. AGARDH., *Theor. Syst. Pl.*, 212.

The proportion of *Cruciferæ* in the Southern Hemisphere is small. Dropping the introduced species, there are about seventy in Chili, a score in Columbia, thirty in Australia, and half a hundred in South Africa. The Tropics are very poor in *Cruciferæ*, which all but disappear at the Equator. In the temperate regions of Asia, Europe, and even North America their number increases enormously. The Levant is the richest locality; next come the two shores of the Mediterranean and Temperate Europe. In California and Texas the Crucifers are still pretty numerous, as well as in the Eastern States. Their number decreases on going northwards, in both Continents;[1] moreover, here, as in other orders, there are generic types spread nearly all over the globe, such as *Nasturtium*, *Draba*, *Cardamine*, *Thlaspi*, *Erysimum*, *Sisymbrium*, &c.; others are peculiar to sometimes very limited regions: thus, in Australia, *Blennodia*, *Menkea*, *Geococcus*, *Stenopetalum*; in Tropical Africa, *Heliophila*, *Chamira*, *Brachycarpæa*, *Palmstruckia*, &c.; in Chili, *Schizopetalon*, *Mathewsia*, *Cremolobus*, *Menonvillea*, *Hexaptera*. Other genera, usually monotypic, are still more limited. *Atelanthera*, in West Thibet; *Parolinia*, in the Canaries; *Streptoloma*, on the shores of the Caspian; *Porphyrocodon*, in New Granada; *Warea*, in Florida; *Mancoa*, in the Peruvian Andes; *Bivonæa*, in Sicily; *Morisia*, in Corsica and Sardinia; *Hemicrambe*, at Tangier; *Nothothlaspi* and *Pachycladon*, in New Zealand; *Pringlea*, in Kerguelen's Land, &c.

The properties of the Crucifers,[2] like their organization, are pretty uniform. Many are used for food, owing to the deposits in their

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[1] A. DE CANDOLLE, in his *Géographie Botanique*, has collected the numbers given by various authors for the proportion of *Cruciferæ* to Phanerogams at large. In the different countries of Europe it varies from 4 to 6 per cent. generally. In Spain the percentage rises to 7·5 (BOISSIER). In Asia there are in Daouria, 6 (LEDEB.); North China, 4·5 (BUNGE); Japan, 2 (ZUCCARINI). In Africa: Egypt, 5 (DELILE); Algeria, 4·5 (DESF.); Madeira, 5 (LOW.); Canary Islands, 3 (WEBB). In America: Northern States, 2 (BECK); New California, 3·5 (HOOK. & ARN.); Chili, 2 (C. GAY). The percentage always falls 1 below in hot countries, such as Tropical Africa, India, Timor, New Guinea, Tropical America. Melville Island has the largest known—13·5 (R. BR.). The same author also gives several Crucifers among the species extending over at least a third of the globe—viz., *Capsella Bursa pastoris*, several species of *Nasturtium*, *Cardamine hirsuta*, *Erysimum cheiranthoides*.

[2] GUIB., *Drog. Simpl.*, ed. 6, iii. 672.—LINDL., *Fl. Med.*, 91; *Veg. Kingd.*, 353.—ENDL., *Enchirid.*, 452.—PEREIRA, *Elem. Mat. Med.*, ed. 4, ii. p. ii. 576.—ROSENTH., *Syn. Pl. Diaphor.*, 629, 1142.

various organs; like the Radishes,[1] and the various Cabbages and Turnips, in which we have studied[2] the seat of these deposits. In several the leaves are eaten, either cooked, as in Sea Kale[3] (*Chou marin*, figs. 248–253), and certain species of *Lepidium*, *Cardamine*, *Raphanus*, *Pringlea*,[4] *Matthiola*,[5] *Zilla*,[6] &c.; or raw, in salad, like the cultivated Cresses (*Cressons*). These last are not mere insipid green vegetables, but are distinguished by a greater or less development of the stimulant pungency, or even acridity common to most medicinal Crucifers.[7] The Water Cress (*Cresson officinal*, *C. de fontaine*) is *Nasturtium officinale*,[8] growing wild or cultivated in fresh water. It is pretty powerful as a stomachic, diuretic, depurative, and, above all, antiscorbutic.[9] From it is distinguished the Creeping Watercress (*Cresson sauvage*; *N. sylvestre*)[10] possessing the same virtues, though less used. The Cress of our gardens (*C. alénois* or *Nasitort*) is a member of the totally different genus *Lepidium*; it is *L. sativum*,[11] and acrid and antiscorbutic, and sternutatory. Bittercress (*Cresson des près*), the least used of all, is *Cardamine pratensis*.[12] For the same purposes, medicinal

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8 R. BR., in *Ait. Hort. Kew.*, ed. 2, iv. 110.—SPACH, *op. cit.*, vi. 432.—GUIB., *op. cit.*, iii. 675, fig. 752.—CHATIN, *le Cresson*, 18mo. (Paris, 1866).—*N. siifolium* REICHB.—*N. microphyllum* REICHB.—*Sisymbrium Nasturtium* L., *Spec.*, 916.—*Cardamine fontana* LAMK.—*Cardaminum Nasturtium* MŒNCH.

9 It contains iodine, iron, phosphates, an essential oil containing sulphur and nitrogen, which gives it its peculiar pungency (CHAT., *op. cit.*, 96), and is used for medicine in the forms of the fresh juice, syrup, soft or dry conserve, extract, and milk of Watercress. It enters into the *sirop de Raifort iodé* of Parisian druggists.

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7 *Brassica arvensis.*—*Sinapis arvensis* L. (see above, p. 192, note 1, figs. 238–241).—GUIB., *loc. cit.*, 685.—ROSENTH., *op. cit.*, 643.

8 *Brassica alba.*—*Sinapis alba* L. (see above, p. 191, note 6).—GUIB., *loc. cit.*, 686, fig. 759.—HAYNE, *Arzn. Gew.*, viii. t. 39.—NEES, *Pl. Off.*, t. 402.—TURP., *Fl. Méd.*, ic.—LINDL., *Fl. Med.*, 92.—PEREIRA, *loc. cit.*, 583.—RÉV., in *Fl. Méd. du* xixe *Siècle*, ii. 373.

9 *Brassica nigra.*—*Sinapis nigra* L. (see above, p. 191, note 2).—GUIB., *loc. cit.*, 687, fig. 758.—HAYNE, *Arzn. Gew.*, viii. t. 46.—NEES, *Pl. Off.*, t. 403.—TURP., *Fl. Méd.*, ic.—LINDL., *Fl. Med.*, 92.—PEREIRA, *loc. cit.*, 579, fig. 104.—A. RICH., *Elém.*, éd. 4, ii. 402.—RÉV., in *Bot. Méd. du* xixe *Siècle*, i. 373, t. 35.—ROSENTH., *loc. cit.*, 643.

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The other Crucifers which possess in a less degree a pungent taste, with stimulant, acrid, astringent properties, are the Wild Rocket[1] (*Roquette Sauvage*), the cultivated Rocket[2] (*Roquette Cultivée*), *Thlaspi officinalis*,[3] Rape[4] (*Ravette*), Garlic Mustard or Sauce-alone (*Alliaria*,[5] figs. 214, 215), several species of *Iberis*,[6] *Teesdalia*,[7] *Arabis*,[8] *Sisymbrium*,[9] *Alyssum*,[10] *Capsella*,[11] *Draba*,[12] *Cakile*,[13] *Coronopus*,[14] &c., all natives or introduced and cultivated in this country. In Asia *Sinapis chinensis*[15] and *Arabis chinensis*,[16] serve the same purposes, and are recommended by the Hindoo doctors as stomachic stimulants. Their action may be intense enough to determine abortion. *Savignya ægyptica*[17] has the same properties as the Cresses;

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[1] *Brassica tenuifolia.*—*B. muralis* HUDS.—*Sisymbrium tenuifolium* L.—*Diplotaxis tenuifolia* DC., *Prodr.*, i. 222, n. 8.—GUIB., *loc. cit.*, 686.—ROSENTH., *op. cit.*, 644.—*Eruca muralis* GÆRTN., MEY. & SCHERB., *Fl. Wett.*—*Sinapis tenuifolia* R. BR. MOQUIN (*Bot. Méd.*, 186) has prepared from it an antiscorbutic syrup. It is often called *Sisymbre brûlant*.

[2] *Eruca sativa* LAMK., *Fl. Fr.*, ii. 496.—GUIB., *loc. cit.*, 683.—*E. Ruchetta* SPACH, *Suit. à Buffon*, vi. 355. Its leaves are pungent and aperient; its seeds more acrid than even those of the Black Mustard. The ancients regarded all these plants as diuretic, antiscorbutic, and aphrodisiac (ROSENTH., *op. cit.*, 644).

[3] Which is, according to GUIBOURT (*loc. cit.*, 681), *Lepidium campestre* R. BR. Its seeds enter into the composition of *theriaca*.

[4] A cultivated race, according to SPACH (*Suit. à Buffon*, vi. 371), of *Brassica Rapa* KOCH (*Napus Rapa* SPENN.). Its seeds are harvested, and yield colza oil. There are two kinds, a winter and a summer Rape.

[5] *Sisymbrium Alliaria* SCOP., *Fl. Carn.*, 515.—*Erysimum Alliaria* L.—*Hesperis Alliaria* LAMK.—*Alliaria officinalis* ANDRZJ., ex BIEB., *Fl. Taur.*, Suppl., 445.—DC., *Prodr.*, i. 196, n. 1.—H. BN., in *Dict. Encycl. des Sc. Méd.*, iii. 541.

[6] Especially *I. umbellata* L. (ROSENTH., *op. cit.*, 635), whose seeds are the *semina Thlaspeos Cretici* of old pharmacopœias.

[7] Especially *T. nudicaulis* R. BR., in *Ait. Hort. Kew.*, ed. 2, iv. 83;—*T. Iberis* DC., *Prodr.*, i. 178, n. 1;—*Iberis nudicaulis* L., *Spec.*, 903).

[8] *A. arenosa* SCOP., *ciliata* KOCH, *perfoliata* LAMK., *sagittata* DC. and *Thaliana* L. (See H. BN., in *Dict. Encycl. des Sc. Méd.*, v. 756.)

[9] Especially Flixweed, the *Sophia* or Wisdom (Fr., *Sagesse*) of surgeons (*S. Sophia* L.), and *S. polyceratium* L., and *Columnæ* L. (see ROSENTH., *op. cit.*, 637). *S. toxophyllum* C. A. MEY., of South Russia, is said to poison horses.

[10] Notably *A. montanum* L. (see H. BN., in *Dict. Encycl. des Sc. Méd.*, iii. 467), and *A. maritimum* LAMK. (*Kœniga maritima* R. BR.), which is the *Nasturtium* or *Thlaspi maritimum* of old pharmacopœias.

[11] The species most commonly used is the Shepherd's Purse (*Capsella Bursa-pastoris* L.), a popular remedy in country places in France. (See H. BN., in *Dict. Encycl. des Sc. Méd.*, xii.)

[12] *D.* (*Erophila*) *verna* L. serves the same purpose as *Capsella*; whence its name, *Herba Bursæ pastoris minimæ*.

[13] *C. maritima* SCOP. (*Fl. Carn.*, n. 844;—DC., *Prodr.*, i. 185, n. 1;—SPACH, *Suit. à Buffon*, vi. 332;—*C. Serapionis* GÆRTN., *Fruct.*, t. 141, ii. fig. 2;—*C. ægyptiaca* W., *Spec.*, iii. 417;—TUSS., *Fl. Ant.*, 1, t. 17;—*C. æqualis* LHÉR.;—*C. americana* NUTT.;—*C. cubensis* K.) has its young shoots eaten in salad, or pickled. The leaf-buds are antiscorbutic, and the whole plant is used on the sea coast as an aperient, diuretic, &c.

[14] *C. Ruellii* DALECH. (*Senebiera Coronopus* DC.;—*Cochlearia Coronopus* L.) was used as an antiscorbutic under the name of *Herba Nasturtii verrucosi* s. *Coronopi repentis*. (See ROSENTH., *op. cit.*, 646.)

[15] L., *Mantiss.*, 95. In Asia, *S. cernua* THUNB., *dichotoma* ROXB., *glauca* ROXB., *ramosa* ROXB., *rugosa* ROXB., have the same reputation. *S. pekinensis* LOUR. is eaten as an aperient. *S. juncea* L. (*S. nigra* FORSK.), is, according to T. VON MARTIUS, the Mustard of Sarepta. (See ROSENTH., *op. cit.*, 644.—LINDL., *Veg. Kingd.*, 92.)

[16] The *Aliverie* of the Indians; according to AINSLIE (*Mat. Med. Ind.*, ii. 12), a stimulant, and even abortive. It is also applied to inflamed surfaces. (See H. BN., in *Dict. Encycl. des Sc. Méd.*, v. 756, n. 2.)

[17] DC., *Syst.*, ii. 244; *Prodr.*, i. 157.—ROSENTH., *op. cit.*, 644: the same as *Lunaria parviflora* DEL., used by the Arabs.

so have *Heldreichia Kotschyi*[1] and certain *Farsetias*[2] in Asia, *Nasturtium humifusum*[3] in Senegal, *N. indicum*[4] in India, *N. terrestre*[5] in Australia, *Lepidium owaihiense, piscidium, oleraceum*,[6] in the Sandwich Islands, and *Hutchinsia chinensis*[7] in China. Strange to say, among all these stimulant plants, the Hedge Mustard[8] (*Vélar officinal*) is neither acrid nor pungent, but only harsh and astringent.

The seeds of *Cruciferæ* are also noteworthy for the quantity of fixed oil they contain used in the arts as well as for household purposes and food. Among the best known are the Colewort or Colza[9] (figs. 228–231), the Winter and Summer Rape, and the cultivated *Camelina*[10] (fig. 283). The seeds of the various Cabbages and Radishes contain a good deal of oil, of which but little use is made; so with *Isatis*, *Erucastrum*, and *Crambe*. Special therapeutic virtues are ascribed to the seeds of many Crucifers, such as *Cheiranthus Cheiri*,[11] *Cardamine impatiens*,[12] *Lunaria rediviva* and *biennis*,[13] *Iberis umbellata*,[14] *Hesperis matronalis* and *tristis*,[15] *Sisymbrium Sophia*,[16] *Alliaria*, *Capsella Bursa pastoris*, and several species of *Brassica*, *Lepidium*, and *Bunias*.[17]

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1 BOISS., *Fl. Or.*, i. 319.—ROSENTH., *op. cit.*, 635; used chiefly in scurvy of the gums.

2 *F. clypeata* R. BR. is said to be the ἀλύσσων of DIOSCORIDES (ROSENTH., *op. cit.*, 633), supposed to cure scorbutic ulcers, skin diseases, hydrophobia, &c.

3 GUILL. & PERR., *Fl. Seneg. Tent.*, i. 19.

4 DC., *Syst.*, ii. 199; *Prodr.*, i. 139, n. 22.—ROSENTH., *op. cit.*, 631.—*Sisymbrium indicum* L., *Mantiss.*, 93.

5 R. BR., in *Ait. Hort. Kew.*, ed. 2, iv. 110 (a form of *N. palustre* DC.). Its root is also edible.

6 FORST., *Prodr.*, n. 248. — DC., *Prodr.*, i. 207, n. 38.—ROSENTH., *op. cit.*, 639.

7 Bitter and antiscorbutic; given in dropsy and pulmonary catarrh.

8 *Sisymbrium officinale* SCOP., *Fl. Carn.*, ii. 26.—DC., *Fl. Fr.*, iv. 672; *Prodr.*, i. 191, n. 1.—SCHK., *Handb.*, t. 183.—TURP., *Fl. Méd.*, ic.—GUIB., *loc. cit.*, 680, fig. 755. — RÉV., in *Bot. Méd. du* xixe *Siècle*, iii. 447, t. 48.—MOQ., *Bot. Méd.*, 108, t. 35.—*Erysimum officinale* L., *Spec.*, 922. — *Chamæplium officinale* WALLR., *Sched. Crit.*, 377.—SPACH, *Suit. à Buffon*, vi. 435. It is the *Herbe au chantre* or *Tortelle*, and forms the basis of a *Compound Syrup of Erysimum*, used in the treatment of pulmonary catarrh, &c.

9 A cultivated race (SPACH, *Suit. à Buffon*, vi. 370) of *Brassica Napus* KOCH.—*B. campestris* L., *Spec.*, 931.—*Brassica Napus oleifera* DC.—GUIB., *loc. cit.*, 685.

10 *Camelina sativa* FR., *Nov. Mant.*, iii. 72.—GUIB., *loc. cit.*, 681.—ROSENTH., *op. cit.*, 637. Besides the oil, the seeds themselves have been used in medicine under the name of *Semina Sesami vulgaris*.

11 Its herbaceous parts are bitter, acrid. The flowers have a strong scent, which makes them slightly excitant and diaphoretic.

12 L., *Spec.*, 914. Its seeds are diuretic, and of use in dysentery. The same applies to the *Dentarias* (which really belong to the genus *Cardamine*), especially *D. bulbifera* L. (*Herba Dentariæ minoris s. antidysentericæ*), *digitata* LAMK., *enneaphylla* L., *pinnata* LAMK., &c. These plants are sometimes used for food, as is *D. diphylla* MICHX., on which horses are fed in America (see ROSENTH., *op. cit.*, 632).

13 Their seeds are stimulating, pungent, &c. (See H. BN., in *Dict. Encycl. des Sc. Méd.*, sér. 2, iii. 187.) They were used under the name of *semina Violæ lunariæ*.

14 L., *Spec.*, 906.—DC., *Prodr.*, i. 179, n. 10. It is a diuretic, pectoral, and anticatarrhal.

15 Recommended as pectorals, &c. (ROSENTH., *op. cit.*, 636), under the name of *Viola matronalis s. damascecena*.

16 See p. 224, note 9.

17 *B. Erucago* L. (*Spec.*, 935;—DC., *Prodr.*, i. 230, n. 1;—ROSENTH., *op. cit.*, 646) has a penetrating smell and taste. It was used under the name of *Herba Erucaginis* in ascites and other forms of dropsy.

There are few tinctorial Crucifers; the chief are *Neslia paniculata*,[1] and Woad[2] (*Pastel*; figs. 257–260), formerly so much prized in Europe as a blue dye.

The Rose of Jericho[3] (fig. 209) has been celebrated as a curiosity since the crusades. In dry weather its branches roll up in a ball, and are torn up and carried by the winds over the sands of the desert. It has given rise to thousands of fables and fantastic tales. In the East it is still believed that if it expands in the lying-in room, it presages a prompt and easy delivery. Finally there are many Crucifers that adorn our gardens by their beautiful flowers or their sweet scent. Of those with beautiful corollas, white, yellow, violet, or red, we need only mention the various species of Wallflower, Stock, Honesty, *Thlaspi*, *Aubrietia*, *Malcolmia*, *Moricandia*,[4] &c. Certain species of *Brassica* are ornamental owing to the variegation or quaint form of their leaves, which are laciniate, curly or crumpled, green, or spotted with purple white or yellow.

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1 DESVX., in *Journ. Bot.*, iii. 162. It was used in the same way as Woad.

2 *Isatis tinctoria* L., *Spec.*, 936.—GÆRTN., *Fruct.*, ii. t. 142, fig. 6.—SCHK., *Handb.*, t. 188.—SPACH, *Suit. à Buffon*, vi. 575.—GUIB., *loc. cit.*, 682, fig. 756.—ROSENTH., *op. cit.*, 640. (*Guède*, *Vouède*, *Gaude*, &c.)

3 *Anastatica hierochuntina* L., *Spec.*, 985.—GUIB., *loc. cit.*, 679.—H. BN., in *Dict. Encycl. des Sc. Méd.*, iv. 188 (*Jérose hygrométrique*).

4 *Orychophragmus sonchifolius*, which has the flowers of *Moricandia*, is cultivated, though much more rarely, with far more difficulty; so are the *Heliophilas*, some of which have pretty blue flowers; and, in the conservatory, *Porphyrocodon pictum*, which has probably the most beautiful flowers of the order. [For details and bibliography of the mode of fertilization of the flowers in this order, see H. MÜLLER, *Befruchtung der Blumen durch Insekten* (Leipsig, 1873), 133-142].

GENERA.

I. CHEIRANTHEÆ.

a. ARABIDINEÆ.—*Cotyledons usually accumbent.*

1. **Cheiranthus** T.—Flowers hermaphrodite regular; receptacle depressed-conical. Sepals 4, decussately imbricate; lateral saccate at base. Petals 4, cruciate, long-unguiculate, imbricate. Stamens 6, 4-dynamous; filaments free; 2 lateral shorter; anthers introrse 2-rimose. Glands of disk hypogynous, usually 2, irregularly surrounding base of lateral stamens. Germen free elongated; style short; apex 2-lobed stigmatose; lobes spreading. Ovules ∞, descending campylotropous; funicles free. Siliqua elongated compressed, or 4-gonous; valves flat or connate, 1-ribbed; septum membranous. Seeds ∞, 1-seriate, campylotropous. Embryo rather fleshy (sometimes coloured); cotyledons accumbent, more rarely incumbent oblique.—Undershrubs or herbs, usually perennial, pubescent with appressed 2-partite hairs, more rarely stellate-tomentose; leaves alternate, oblong or linear, entire or toothed; flowers in terminal racemes (*Temperate Europe, North Africa and Canary Islands, West and Central Mountainous Asia, Frigid North America*). See p. 179.

2. **Atelanthera** HOOK F. & THOMS.[1]—Sepals small erect equal. Petals linear-spathulate emarginate. Anthers 6, unguiculate at apex, 1-celled in 4 larger stamens. Siliqua linear subcompressed; valves 1-ribbed; septum membranous; style short, at apex stigmatiferous 2-lobed. Seeds 1-seriate compressed, not marginate.—An annual herb, low, very slender, hispid with small appressed 2-partite bristles; stem thin; leaves few linear entire; flowers few, in a short terminal raceme (*West Thibet*[2]).

3. **Nasturtium** R. BR.[3]—Sepals short patulous, at base equal or

[1] In *Journ. Linn. Soc.*, v. 138.—B. H., *Gen.*, 68, n. 6.

[2] Spec. 1. *A. perpusilla* HOOK. F. & THOMS., *loc. cit.*

[3] In *Ait. Hort. Kew.*, ed. 2, iv. 109.—SPACH, *Suit. à Buffon*, vi. 430.—DC., *Prodr.*, i. 137.—ENDL., *Gen.*, n. 4850.—A. GRAY, *Gen. Ill.*, t. 53.—B. H., *Gen.*, 68, n. 7.—*Leiolobium* REICHB.,

slightly unequal. Petals shortly unguiculate, or 0. Stamens 6, 4-dynamous or 5—1; unequal. Siliqua short or more or less elongated, subterete, rarely 2-dynamous; style short rather thick; stigmatiferous apex subcapitate, simple or 2-lobed. Seeds ∞, 2-seriate, very rarely 1-seriate, minute turgid; funicles short free.—Branching herbs of variable habit, glabrous or pubescent with simple hairs, sometimes aquatic; leaves entire or variably lobed or pinnatisect; flowers[1] in short racemes, sometimes bracteate[2] (*All regions of the World*[3]).

4. **Barbarea** R. Br.[4]—Sepals erect equal, or lateral subsaccate at base. Petals long-unguiculate. Stamens 6 free, 4-dynamous. Glands 6, alternate; 2 placentary longer and narrower. Siliqua elongated, usually rigid, compressed; style short thick sometimes ob-conical; apex compressed, capitate or 2-lobed; valves carinate or costate; septum narrow hyaline. Seeds 1-seriate oblong, not margi-nate; funicles free; cotyledons accumbent on ascending radicle.—Herbs erect ascending glabrous, 2-ennial or perennial; stem angulate; leaves entire runcinate-lobate or sinuate-pinnatifid; flowers[5] in some-

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Consp., 184 (*Camelinæ* sect. *Pseudolinum* DC., *Syst.*, ii. 517).—*Roripa* Bess. (part.), ex Gren. & Godr., *Fl. de Fr.*, i. 125 (? *Nasturtiopsis* Boiss., *Fl. Or.*, i. 237).—*Brachylobos* Schur., *Enum. Pl. Trans.*, 39 (Sect. ii. DC., *Prodr.*, i. 137.)—*Clandestinaria* Spach, *Suit. à Buffon*, vi. 478.

[1] Usually small, yellow.

[2] Several subgenera and species have been proposed, referred by various authors, some to *Cochlearia*, some to *Nasturtium*, and some to new genera. The three following of De Candolle must be held the best, but on account of a few species varying between them, they are neither certain nor altogether natural: 1. *Cardaminum*, siliqua short declinate, petals white; 2. *Brachylobos*, siliqua short declinate, petals yellow; 3. *Clandestinaria*, siliqua elongated erect, petals very short or 0. *Alyssopsis deflexa* Boiss. (Walp., *Rep.*, i. 134), though differing in its uni-seriate seeds, agrees exactly with *Nasturtium* in flower and siliqu . *N. officinalis* has a ribbed siliqua as in *Barbarea*. *Tetrapoma barbareifolia* Turcz. (in *Linnæa*, x. *Litt.*, 104;—Endl., *Gen.*, n. 4883;—Deless., *Ic. Sel.*, ii. t. 70;—Payer, *Organog.*, 211, 215, t. 44;—Seem., *Bot. Her.*, t. 2;—Walp., *Rep.*, i. 154), a plant remarkable for its usually 4-carpellary gynæceum and fruit, and held the prototype of a distinct genus by many authors, is now better considered by A. Gray and others a sport of *Nasturtium palustris* R. Br. (See p. 183, not. 4, figs. 210–213.)

[3] Spec. about 20 (about 80 are described by authors). Reichb., *Ic. Fl. Germ.*, ii. t. 50–54.—Gren. & Godr., *Fl. de Fr.*, i. 97.—Benth., *Fl. Hongk.*, 16.—Griseb., *Fl. Brit. W. Ind.*, 13.—Eichl., in *Mart. Fl. Bras.*, *Crucif.*, 298, t. 66.—Harv. & Sond., *Fl. Cap.*, i. 21.—Triana & Pl., in *Ann. Sc. Nat.*, sér. 4, xvii. 58.—Walp., *Rep.*, i. 125; ii. 755; v. 34; *Ann.*, i. 27; ii. 32; iii. 815; iv. 193; vii. 98. (Most of these species are distinguished by no technical character from *Cochlearia* B. H., *loc. cit.*) *Roripa* Bess., *Enum. Pl. Vohhyn.* (ex Gren. & Godr., *Fl. de Fr.*, i. 125) includes a few species between *Nasturtium*, *Sisymbrium*, and *Cochlearia*, among which, according to several authors, the most noteworthy is *R. rusticana* Gren. & Godr., *loc. cit.*, which is *Cochlearia Armoracia* L. (See p. 202, fig. 276, and pp. 223, not. 5, 270, not. 7.)

[4] In *Ait. Hort. Kew.*, ed. 2, iv. 109.—DC., *Prodr.*, i. 140.—Spach, *Suit. à Buffon*, vi. 417.—Endl., *Gen.*, n. 4851.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 139.—B. H., *Gen.*, 69, n. 8.

[5] Yellow.

times elongated racemes; pedicels ebracteate or bracteate[1] (*Temperate regions in both Worlds*[2]).

5. **Arabis** L.[3]—Sepals usually rather short, equal at base, or lateral saccate at base. Petals equal entire, usually unguiculate. Stamens 6, 4-dynamous. Siliqua sessile elongated, thin, linear, compressed; style usually short or next to none; stigmatiferous apex simple or 2-lobed; valves flat keeled or ribbed, sometimes fleshy (*Stevenia*),[4] more rarely marked by oblique crowded ribs between keel and edge (*Falklandina*);[5] septum membranous. Seeds ∞, 1- or very rarely 2-seriate (*Turrtis*,[6] *Falklandina*), more rarely few (*Stevenia*), compressed, marginate winged or immarginate; embryo somewhat fleshy; cotyledons usually accumbent:—Herbs, annual or perennial, glabrous or stellate-tomentose with furcate hairs, or hoary; radical leaves usually spathulate; cauline sessile; flowers[7] in ebracteate racemes (*All Temperate, Alpine and Frigid regions*[8]).

6. **Streptanthus** Nutt.[9]—Sepals usually petaloid, either equal at base, or 2 or 4 saccate at base, broadly imbricate. Petals unguiculate; claw straight or twisted. Stamens 6; filaments usually surrounded by somewhat thick glands at base; the longer often connate in pairs to a greater or less distance. Siliqua sessile, compressed or sub-4-gonous, narrow or wide; valves nearly flat, 1-ribbed; septum hyaline, occasionally shining; apex of style stigmati-

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[1] A genus not easy to distinguish from *Nasturtium*, differing chiefly in its "robuster habit, more rigid siliqua, with carinate valves and 1-seriate seeds." (B. H., *loc. cit.*)

[2] Spec. about 20. Reichb., *Ic. Fl. Germ.*, ii. t. 47–19.—Gren. & Godr., *Fl. de Fr.*, i. 90.—A. Gray, *Gen. Ill.*, t. 62.—A. Mey., *Midd. Sib. Reis.*, i. 2, 14.—Reg. & Til., *Fl. Ajan.*, 45, in *Mém. Mosc.* (1859), xi.—Boiss., *Fl. Or.*, i. 183.—Walp., *Rep.*, i. 128; ii. 755; v. 34; *Ann.*, i. 27; vii. 101.

[3] *Gen.*, n. 818.—J., *Gen.*, 238.—R. Br., in *Ait. Hort. Kew.*, ed. 2, iv. 104.—DC., *Prodr.*, i. 142.—Spach, *Suit. à Buffon*, vi. 436.—Endl., *Gen.*, n. 4854.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 140.—A. Gray, *Gen. Ill.*, t. 58.—B. H., *Gen.*, 69, n. 9.—*Arabidium* Spach, *loc. cit.*, 436.

[4] Ad. & Fisch., in *Ledeb. Fl. Ross.*, i. 123.—DC., *Prodr.*, i. 141.—Endl., *Gen.*, n. 4855.

[5] The type of this subgenus is *A. falklandica* Hook., whose siliqua has rigid carinate valves.

[6] L., *Gen.*, 819.—DC., *Prodr.*, i. 141.—Endl., *Gen.*, n. 4853.—A. Gray, *Gen. Ill.*, t. 59.

[7] White, straw-coloured, pink, or purplish.

[8] Spec. about 60 (as many as 130 given by authors). Reichb., *Ic. Fl. Germ.*, ii. t. 33–44.—Deless., *Ic. Sel.*, ii. t. 20, 21.—Gren. & Godr., *Fl. de Fr.*, i. 99.—Boiss., *Fl. Or.*, i. 165.—Harv. & Sond., *Fl. Cap.*, i. 22.—Walp., *Rep.*, i. 129 (*Turritis*), 130; ii. 756; v. 34; *Ann.*, i. 28; ii. 34; v. 193; vii. 101.

[9] Nutt., in *Journ. Acad. Philad.*, v. 134, t. 7.—Torr. & Gr., *Fl. N.-Amer.*, i. 75.—A. Gray, *Gen. Ill.*, t. 60, 61.—Endl., *Gen.*, n. 4852.—B. H., *Gen.*, 69, 966, n. 12.

ferous simple. Seeds (almost of *Matthiola*) 1-seriate, much compressed marginate.—Herbs, annual or perennial, glabrous; leaves entire or the lower lyrate-pinnatifid; cauline leaves sessile or occasionally amplexicaul; flowers[1] in terminal racemes, bracteate or ebracteate[2] (*North America, especially the eastern parts*[3]).

7. **Cardamine** T.[4]—Sepals equal at base. Petals unguiculate. Flowers and fruit otherwise nearly of *Arabis*; siliqua elongated linear-compressed; valves flat, almost ribless separating elastically; septum hyaline; style short or elongated; apex stigmatiferous, more or less enlarged, simple or 2-lobed; replum obtuse (*Dentaria*)[5] or acute or alate (*Pteroneuron*).[6] Seeds ∞, 1-seriate, somewhat compressed immarginate; funicles occasionally enlarged (*Pteroneuron, Dentaria*); embryo rather fleshy (occasionally coloured); cotyledons accumbent or more rarely incumbent.[7]—Herbs, usually flaccid and glabrous; rhizome sometimes scaly or bulbiferous (*Dentaria*); leaves alternate, more rarely opposite, or 3–4-verticillate (*Dentaria*), occasionally pinnatisect; flowers[8] in racemes, sometimes subcorymbose, ebracteate, erect or nutant (*All Temperate, cold and Alpine regions*[9]).

8. **Dryopetalum** A. Gray.[10]—"Sepals suberect; lateral subsaccate at base. Petals unguiculate, 5–7-lobed. Stamens without teeth. Siliqua[11] elongated, somewhat terete, many-seeded; valves 3-ribbed

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[1] Often handsome, sometimes pendulous, purple, or more rarely white or yellow.

[2] Sections 2, according to Endl.: 1. *Eustreptanthus*; calyx rather spreading; limb of petals broad.—2. *Euclisia* (Nutt.); calyx closed; limb of petals narrow. The genus is very near *Arabis*.

[3] Spec. about 13. Hook., *Icon.*, t. 40, 44.—A. Gray, in *Proceed. Amer. Acad.*, vi. 182.—*Bot. Mag.*, t. 3317, 3516.—Walp., *Rep.*, i. 128; *Ann.*, ii. 33; iv. 192; vii. 104.

[4] *Inst.*, 224, t. 109.—L., *Gen.*, n. 812.—Adans., *Fam. des Pl.*, ii. 418.—J., *Gen.*, 239.—Lamk., *Dict.*, ii. 182; Suppl., ii. 393; *Ill.*, t. 562.—DC., *Prodr.*, i. 149.—Spach, *Suit. à Buffon*, vi. 439.—Endl., *Gen.*, n. 4859.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 144.—B. H., *Gen.*, 70, 966, n. 13.

[5] L., *Gen.*, n. 811.—DC., *Prodr.*, i. 154.—Endl., *Gen.*, n. 4861.—A. Gray, *Gen. Ill.*, t. 56.

[6] DC., *Prodr.*, i. 154.—Endl., *Gen.*, n. 4860.

[7] *Kardanoglyphos* Schltl. (in *Linnæa*, xxviii. 472) has its seeds irregularly arranged, says its author, not 1-seriate, as in the other species.

[8] White, pink, purple, or violet ("never? yellow").

[9] Spec. about 60. Reichb., *Ic. Fl. Germ.*, ii. 29 (*Pteroneuron*), 30–32 (*Dentaria*).—Gren. & Godr., *Fl. de Fr.*, i. 106.—Boiss., *Fl. Or.*, i. 160, 164 (*Dentaria*).—Hook. f., *Handb. N.-Zeal. Fl.*, 11.—Benth., *Fl. Hongk.*, 16; *Fl. Austral.*, i. 67.—Triana & Pl., in *Ann. Sc. Nat.*, sér. 4, xvii. 59 (part.).—Griseb., *Fl. Brit. W. Ind.*, 13.—Eichl., in *Mart. Fl. Bras.*, *Crucif.*, 300, t. 67.—Barn., in *C. Gay Fl. Chil.*, i. 107.—Wedd., in *Ann. Sc. Nat.*, sér. 5, i. 290.—Phil., in *Linnæa*, xxviii. 664; xxx. 186.—Harv. & Sond., *Fl. Cap.*, i. 23.—Walp., *Rep.*, i. 135, 138 (*Dentaria*); ii. 757; v. 35, 36; *Ann.*, i. 29; ii. 35; iv. 193; vii. 105.

[10] In *Pl. Wright.*, ii. 12, t. 14.—B. H., *Gen.*, 69, n. 10 (whence we take the characters).

[11] Thin.

carinate; septum narrow membranous, ribless; style somewhat short; stigma terminal, emarginate. Seeds many, 1-seriate oblong subcompressed immarginate.—An erect herb, annual or 2-ennial, branched; radical leaves pubescent or shaggy (hairs simple), runcinate-pinnatifid; cauline leaves subsimilar; racemes[1] terminal, elongated after flowering; pedicels filiform elongated ebracteate"[2] (*New Mexico*[3]).

9. **Macropodium** R. BR.[4]—Sepals lax, equal at base. Petals elongated, long-tapering at base. Anthers elongated twisted. Glands thick. Siliqua pedicellate elongated rather wide; valves thin, flat, veined; septum membranous, 2-ribbed; stigma sessile, small. Seeds almost of *Cheiranthus*.—A tall glabrous herb;[5] leaves alternate, long-petiolate ovate-lanceolate, serrulate or subentire; flowers[6] subsessile in dense spikes (*Altai*[7]).

10. **Leavenworthia** TORR.[8]—Sepals and petals cuneiform, equal. Siliqua oblong-linear; valves thin subinflated, obtusely contracted between seeds; septum hyaline 1-ribbed areolate; style subulate; apex stigmatiferous 2-dentate. Seeds 1–2-seriate orbicular-compressed, winged at margin; embryo compressed; cotyledons auriculate at base; radicle short, conical, "straight."—Low annual herbs; leaves pinnatifid-lyrate; flowers[9] solitary or loosely racemose, on scapes (*North America*[10]).

11? **Loxostemon** HOOK. F. & THOMS.[11]—"Sepals patulous, equal at base. Petals unguiculate, broadly spathulate. Filaments of longer stamens thick, bent abruptly at apex. Siliqua linear;

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1 Flowers white.

2 "A genus scarcely distinct from *Arabis*." (B. H., *loc. cit.*)

3 Spec. 1. *D. runcinatum* A. GRAY, *loc. cit.*—WALP., *Ann.*, iv. 191.

4 In *Ait. Hort. Kew.*, ed. 2, iv. 108.—DC., *Prodr.*, i. 149.—ENDL., *Gen.*, n. 865.—B. H., *Gen.*, 69, n. 11.

5 "Habit of *Stanleya*;" leaves *plantain-like*.

6 White, rather large.

7 Spec. 1. *M. nivale* R. BR., *loc. cit.*—HOOK., *Bot. Misc.*, t. 67.

8 In *Ann. Lyc. N. York*, iii. 87, t. 5.—TORR. & GR., *Fl. N.-Amer.*, i. 89.—A. GRAY, *Gen. Ill.*, t. 57.—ENDL., *Gen.*, n. 4862.—B. H., *Gen.*, 70, n. 16.

9 Yellow.

10 Spec. 2, 3 (1 ex A. GRAY). WALP., *Rep.*, i. 139.

11 In *Journ. Linn. Soc.*, v. 147.—B. H., *Gen.*, 70, n. 14 (whence the characters are taken).

stigma sessile 2-lobed (other parts unknown).—A low annual herb; stem thin glabrous flexuous few-leaved; leaves scattered long-petiolate 3-foliolate; leaflets linear quite entire; corymb few-flowered; flowers[1] slender pedicellate" (*Sikkim Himalaya*[2]).

12. **Morettia** DC.[3]—Sepals equal erect. Petals linear entire. Stamens 6; filaments without teeth; anthers occasionally subsagittate. Siliqua thick stipitate subterete curved erect; style short, rather thick; apex stigmatiferous 2-lobed; lobes divaricated or erect into a cone; valves concave rigid ribbed, incompletely partitioned by transverse septa between seeds; septum opaque. Seeds ∞, 1-seriate, oblong or orbicular, compressed; embryo rather thick; radicle longer than accumbent cotyledons.—Herbs, branched leafy, hispidulous with stellate hairs or hoary-tomentose; leaves all cauline sessile entire dentate; flowers axillary, solitary or subspicate at end of twigs (*Arabia, North Africa*[4]).

13. **Notoceras** R. Br.[5]—Sepals and petals small subequal. Siliqua linear-oblong, cylindrical-sub-4-gonous, dehiscing late, continuous or torulose (*Diceratella*);[6] valves more or less subseptiferous within, carinate, at apex produced obliquely into a horn-like mucro; apex of style minutely capitate. Seeds few immarginate (of *Cheiranthus*).—Herbs, somewhat rigid depressed branching, hoary with 2-partite hairs; leaves linear or ovate sinuate or entire; flowers[7] in leaf-opposed racemes (*West Asia, Mediterranean region, Canary islands*[8]).

14? **Andrzejowskia** Reichb.[9]—Flowers nearly of *Notoceras*; lateral sepals slightly saccate at base. Siliqua linear compressed indehiscent; apex of style minutely capitate; valves sharply keeled, with apex

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[1] Small, lilac.

[2] Spec. 1. *L. pulchellus* Hook. f. & Thoms., *loc. cit.*

[3] *Syst. Veg.*, ii. 426; *Prodr.*, i. 185.—Endl., *Gen.*, n. 4894.—B. H., *Gen.*, 70, n. 17.

[4] Species about 5. Del., *Fl. d'Égypt.*, 77, t. 33, fig. 3 (*Sinapis*).—Boiss., *Diagn. Or.*, viii. 17; *Fl. Or.*, i. 145.—Walp., *Rep.*, i. 159; *Ann.*, ii. 47.

[5] In *Ait. Hort. Kew.*, ed. 2, iv. 117.—DC., *Prodr.*, i. 140.—Endl., *Gen.*, n. 4846.—B. H., *Gen.*, 71, n. 19.—*Diceratium* Lagasc. (ex DC., *Syst.*, ii. 71, 202).

[6] Boiss., *Diagn.*, v. 80 (*Diceratium* ol.); *Fl. Or.*, i. 313.—B. H., *Gen.*, 71, n. 21.

[7] Yellow or pink, small.

[8] Spec. 1 or 2. Deless., *Ic. Sel.*, ii. t. 17.—Boiss., *Fl. Or.*, i. 314.—Walp., *Rep.*, i. 124.

[9] *Fl. Crit.*, i. 15, t. 13.—Endl., *Gen.*, n. 4847.—B. H., *Gen.*, 70, n. 18.—*Macroceratium* DC., *Syst.*, ii. 204.

obliquely produced into conical compressed horns. Seeds few, immarginate. An annual glabrous herb;[1] leaves pinnatisect; petiole subauriculate at base; flowers[2] in terminal racemes, ebracteate (*The Black Sea, Asia minor*[3]).

15. **Parolinia** WEBB.[4]—Sepals bowed at base, subequal erect. Petals long-unguiculate. Stamens 6, 4-dynamous; anther subsagittate. Hypogynous glands 4, within the petals, bowed concave externally. Siliqua linear-oblong, curved, subterete; style thick; apex long-divaricated, stigmatiferous; lobes decurrent; valves septate within, at apex produced into elongated forked horns. Seeds ∞, 1-seriate; cotyledons accumbent; radicle subhorizontal.—A rigid upright undershrub (ashen or whitish); leaves linear entire; flowers[5] in short racemes (*Canary Isles*[6]).

16. **Parrya** R. BR.[7]—Flowers almost of *Matthiola*; lateral sepals flattened or saccate at base. Siliqua compressed, varying in form, sometimes short and wide, or narrow and elongated (*Neuroloma*);[8] valves flat, 1-ribbed, usually veined; septum (hyaline) entire or slit; style short; stigmatiferous lobes connate, elongated or very short. Seeds ∞, in 1, 2-seriate, wingless (*Leiospora*)[9] or winged.—Low shrubs, glabrous or pilose, or hispid, or covered with crowded medifixed hairs; root multiple-perennial; leaves of varying form, simple sinuate or more rarely pinnatifid; flowers[10] solitary, or more frequently racemose; scapes naked or leafy (*Mountains of North Asia, Arctic regions*[11]).

17. **Cithareloma** BGE.[12]—Sepals 4 erect; lateral more or less saccate at base. Petals long-unguiculate; limb narrow. Stamens 6; fila-

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1 Habit altogether of *Cardamine*.

2 White.

3 Spec. 1. *A. cornuta*. — *A. Cardamine* REICHB., *loc. cit.* — WALP., *Rep.*, i. 124. — *Notoceras ?* (*Macroceratium*) *cardaminifolium* DC., *Syst.*, ii. 205; *Prodr.*, i. 140, n. 4.—*Lepidium cornutum* SIBTH., *Fl. Græc.*, t. 617 (ex DC.).

4 In *Ann. Sc. Nat.*, sér. 2, xiii. 133, t. 3 (nec ENDL.).—B. H., *Gen.*, 71, n. 20.

5 Pale pink.

6 Spec. 1. *P. ornata* WEBB, *loc. cit.*—WALP., *Rep.*, i. 124.

7 In *Parry's Voy., App.*, 268.—ENDL., *Gen.*, n. 4856.—B. H., *Gen.*, 67, n. 3.—*Pachyneurum* BGE., in *Linnæa*, xiv. 121.—*Ermannia* CHAM., in *Linnæa*, vi. 533.

8 ANDRZ., in *DC. Prodr.*, i. 156.

9 C. A. MEY., in *Ledeb. Fl. Alt.*, iii. 27.

10 Often handsome; white, pink, or purple.

11 Spec. about 10. LEDEB., *Ic. Fl. Ross.*, t. 86.—HOOK., *Fl. Bor.-Amer.*, i. t. 15.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 135.—BOISS., *Fl. Or.*, i. 159.—WALP., *Rep.*, i. 134; ii. 757; *Ann.*, vii. 97.

12 In *Linnæa*, xviii. 149.—B. H., *Gen.*, 67, n. 4.

ments short free 4-dynamous. Siliqua rather large, linear or elliptical-oblong, much compressed, obtuse at both ends, style slender erect; apex stigmatiferous 2-lobed; lobes linear erect connate; valves flat, 1-ribbed, more or less undulate at edge; septum membranous, 2-lamellate, transversely areolate. Seeds ∞, 1, 2-seriate, orbicular much compressed winged; cotyledons accumbent.—Annual herbs, leafy branching, pilose; leaves dentate or sinuate; flowers in rather short racemes, pedicels ebracteate, subdeflexed when fruiting (*Kirghiz*[1]).

18. **Matthiola** R. Br.[2]—Flowers nearly of *Cheiranthus;* lateral sepals saccate at base. Petals long-unguiculate. Siliquas elongated, terete or compressed; rarely 2-morphous (superior as above) inferior indehiscent subterete (*Diptychocarpus*);[3] stigmatose lobes of style erect connivent, often thickened or horned externally; seeds ∞, 1-seriate compressed, usually marginate-alate; funicles filiform free.—Herbs or branching shrubs; hairs stellate; leaves oblong or linear, entire or sinuate; flowers[4] racemose ebracteate[5] (*West and South Europe, West Asia, North and South Africa*[6]).

19. **Lonchophora** Dur.[7]—Flowers nearly of *Matthiola;* lateral sepals gibbous at base. Siliqua (of tardy dehiscence) sagittate subligneous 4-gonous; valves rigid, dorsally compressed, produced at base into subulate horns (concave above, or slightly incurved at apex), unequally transversely septate; style erect 2-horned; stigmatiferous lobes erect; horns alternating with valves. Seeds ovate-compressed; cotyledons more or less obliquely incumbent.—Annual branching herbs; hairs stellate-tomentose; leaves linear or oblong superior subentire; inferior lyrate or sinuate-pinnatifid; flowers[8] in terminal ebracteate racemes (*Algeria*[9]).

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[1] Spec. 2. Bge., *Enum. Pl. Lehmann.*, t. 5.—Boiss., *Fl. Or.*, i. 238.—Walp., *Rep.*, v. 39; *Ann.*, vii. 96.

[2] In *Ait. Hort. Kew.*, ed. 2, iv. 119.—DC., *Syst.*, ii. 162; *Prodr.*, i. 132.—Spach, *Suit. à Buffon*, vi. 400.—Endl., *Gen.*, n. 4845.—B. H., *Gen.*, 67, n. 1.—*Leucoium* Mœnch, *Meth.*, 257 (nec *Auctt.*).—*Microstigma* Trautv., *Pl. Imag.*, 34, t. 25.

[3] Trautv., in *Bull. Mosc.* (1860), i. 108.—B. H., *Gen.*, 67, n. 2.—*Alloceratium* Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 135 (*Chorispora stricta* DC., *Prodr.*, i. 186, n. 2, referred to *Matthiola* by Bernhardi).

[4] Purple or white; usually handsome.

[5] Sections 2 (ex. B. H., *loc. cit.*): 1. *Pachynotus* (*Luperia*); lobes of style simple or gibbous behind.—2. *Pinaria* (*Acinotus*); lobes horned behind.

[6] Spec. 25–30. Deless., *Ic. Sel.*, ii. t. 11, 12.—Boiss., *Diagn. Or.*, ii. 6, 10; *Fl. Or.*, i. 146.—Gren. & Godr., *Fl. de Fr.*, i. 85.—Walp., *Rep.*, i. 123; *Ann.*, i. 26; ii. 31; iv. 191; vii. 96.

[7] In *Rev. Bot.*, ii. 432; *Fl. Alger.*, t. 72.—B. H., *Gen.*, 71, n. 22.

[8] Violet; handsome.

[9] Spec. 2. Walp., *Ann.*, i. 27; vii. 108.

20 ? **Anastatica** L.[1]—Short sepals and unguiculate petals subequal. Siliqua short ventricose; valves concave and transversely septate inside, externally appendiculate by a very short subulate flattened lamina at base, and a large oblique obtuse, internally concave, lamina at apex; seeds few or 1 (of *Cheiranthus*) in each chamberlet, orbicular or elliptical compressed; style conical; extreme apex capitellate stigmatose.—A low annual branching herb, woody when fruiting; branches involute-connivent into a globe from drought; leaves unequally oblong subdentate petiolate, rugose subtomentose; flowers[2] in short terminal or leaf-opposed spikes (*Syria, Arabia, North Asia*[3]).

b. SISYMBRINEÆ.—*Cotyledons usually incumbent.*

21. **Sisymbrium** L.[4]—Sepals variable, short or elongated, either all equal at base, or lateral pair subsaccate. Petals usually long-tapering at base. Stamens 6, free 4-dynamous. Glands variable, usually small. Siliqua linear-elongated, subterete or compressed; valves concave or convex, usually 3-ribbed; septum subequal to valves, ribless or 2-ribbed; style usually very short; apex stigmatiferous capitate, entire or shortly 2-lobed, more rarely cupulate. Seeds mostly ∞, usually 1-, sometimes 2-seriate, immarginate subterete, usually oblong; funicles free; embryo usually oblong; cotyledons equal or unequal incumbent.—Herbs, usually annual or 2-ennial, glabrous pilose or hoary-tomentose;[5] radical leaves stellately rosulate; cauline alternate, simple or more or less incised, lobed, runcinate-pinnatifid or pinnatisect, at base often auricled amplexicaul; flowers[6] laxly racemose, more rarely axillary, ebracteate or very rarely bracteate[7]

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1 *Hort. Cliff.*, 328; *Gen.*, n. 798 (part.).—J., *Gen.*, 241.—GÆRTN., *Fruct.*, ii. 286, t. 141.—LAMK., *Dict.*, iii. 227; Suppl., iv. 698; *Ill.*, t. 555.—DC., *Syst.*, ii. 425; *Prodr.*, i. 185.—ENDL., *Gen.*, n. 4895.—B. H., *Gen.*, 71, n. 23.—*Hierocontis* ADANS., *Fam. des Pl.*, ii. 421.

2 Small, white.

3 Spec. 1. *A. hierochuntina* L., *Spec.*, 895.—JACQ., *Hort. Vindob.*, t. 58.—R. BR., in *Ait. Hort. Kew.*, ed. 2, iv. 79.—DESVX., in *Journ. Bot.*, iii. 169.—BOISS., *Fl. Or.*, i. 315.—*Bot. Mag.*, t. 4400.

4 L., *Gen.*, n. 813.—ADANS., *Fam. des Pl.*, ii. 417.—J., *Gen.*, 239.—DC., *Prodr.*, i. 190.—ENDL., *Gen.*, n. 4906.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 156.—A. GRAY, *Gen. Ill.*, t. 64.—B. H., *Gen.*, 77, n. 49.—FOURN., *Thès. Fac. Sc. Par.* (1865), n. 275 (incl.: *Alliaria* ADANS., *Aphragmus* ANDRZ., *Arabidopsis* SCHUR., *Braya* STERNB. & HOPPE, *Chamæplium* SPACH, *Descurainia* WEBB, *Discurea* SCHUR., *Drabopsis* C. KOCH, *Eudema* H. B., *Eutrema* R. BR., *Hugueninia* REICHB., *Leptocarpæa* DC., *Norta* SCHUR., *Oreas* CHAM. & SCHLTL., *Orobium* REICHB., *Pachypodium* WEBB, *Platypetalum* R. BR., *Sisymbrella* SPACH (part.), *Tonguea* ENDL., *Tricholobos* TURCZ., *Valarum* SCHUR.).

5 "Never (?) with hoary appressed 2-partite seltæ." (B. H., *loc. cit.*, 78.)

6 Usually yellow, more rarely white, pink, or purplish.

7 The habit varies greatly in this genus, and the external characters simulate many different genera. Hence "the genus *Sisymbrium* is the

(Central and Southern Europe, Temperate Asia, Mountains of North and Tropical Africa, Temperate North and South America[1]*).*

22. **Conringia** REICHB.[2]—Sepals elongated erect; lateral sometimes more or less saccate at base. Petals long-unguiculate. Flowers otherwise of *Sisymbrium* or *Erysimum*. Siliqua[3] often large linear elongated, either compressed or 4-gonous. Style short or elongated

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most difficult of all. From *Brassica* (sect. *Erucastrum*) it differs only in its flat cotyledons; from *Conringia* only in its leaves (*S. fugax* LAGASC., from Spain, has the clavate style of *C. clavatum*). The stigma of *S. pannonicum* shows the two erect lobes of *Malcolmia*. *S. supinum* L. has manifestly 2-seriate seeds, as is common in *Braya*. In *S. pusillum* HOOK. (referred by various authors to *Draba*, *Erysimum*, and *Arabis*) the radicle is oblique. *S. sophioides* (a variety of *S. Sophia*) shows the subumbellate inflorescence of *Thelypodium*. Many sections have been proposed in *Sisymbrium*, but the distinctions between most are very difficult. The following are the best we could make, though not strictly defined." (B. H., *loc. cit.*) Adding the species of *Eutrema* and *Braya*, we get the following 12 sections :—

1. *Norta* DC. (*Prodr.*, i. 191, sect. ii.). Siliquas subterete, spreading ebracteate pedicellate. Seeds 1-seriate. Petals yellow or yellowish white. Sepals spreading. (REICH., *Ic. Fl. Germ.*, ii. t. 80.)

2. *Irio* DC. (incl. *Descurea* DC.—*Descurainia* WEBB, *Phyt. Canar.*, 72.—*Pachypodium* WEBB, *op. cit.*, 75.—*Hugueninia* REICHB., *op. cit.*, t. 81.—*Tonguea* ENDL., *Gen.*, n. 4905.—*Leptocarpæa* DC., *Syst. Veg.*, ii. 201). Fruit of *Norta*. Petals yellow. Sepals erect.

3. *Velarum* (DC., sect. i.—*Chamæplium* SPACH, *Suit. à Buffon*, vi. 433). Siliquas subspicate ebracteate, appressed to rachis, subulate. Flowers yellow. (REICHB., *op. cit.*, ii. t. 72.)

4. *Arabidopsis* (DC., sect. vi.). Siliquas bracteate or ebracteate, pedicellate, spreading or erect, nearly flat, rarely subalate. Seeds 1-seriate. Sepals spreading or erect. Petals white, pink, or purplish. (REICHB., *op. cit.*, ii. t. 60 [*Conringia*].)

5. *Drabopsis* (C. KOCH, in *Linnæa*, xv. 253). Seeds 2-seriate. Other parts of *Norta* (REICHB., *op. cit.*, ii. t. 72.—WALP., *Rep.*, ii. 760).

6. *Braya* (STERNB. & HOPPE, *Diss.*, ex DC., *Syst.*, ii. 210; *Prodr.*, i. 141.—ENDL., *Gen.*, n. 4912.—HOOK. F., in *Journ. Linn. Soc.*, v. 168.—B. H., *Gen.*, 82, n. 70.—FOURN., in *Bull. Soc. Bot. de Fr.*, x. 5.—*Platypetalum* R. BR., in *Parr. Voy. App.*, 266). Siliqua ovate, oblong or linear, sub-compressed or subterete, rarely globose; valves 1-veined or ribbed. Seeds 1- or more often 2-seriate, few or 0.—Cæspitose herbs; flowers shortly racemose or subcorymbose, sometimes solitary; petals white, pink, or purple. (Spec. about 12, from all Frigid and Arctic Regions. REICHB., *op. cit.*, ii. t. 56.—WEDD., *Chlor. Andina*, i. t. 85.—WALP., *Rep.*, i. 171, 174 (*Platypetalum*); ii. 761.)

7. *Eudema* (H. B., *Pl. Æquin.*, ii. 133, t. 125). Flowers of *Braya*; septum perforate. Scape sometimes 1-flowered. (WALP., *Rep.*, v. 41.)

8. *Oreas* (CHAM. & SCHLTL., in *Linnæa*, i. 29, t. 1.—*Aphragmus* ANDRZ., in *DC. Prodr.*, i. 209.—*Orobium* REICHB., *Consp.*, 185). Flowers of *Braya*; septum 0.

9. *Kibera* (DC., *loc. cit.*, 194, sect. v.). Siliquas axillary or bracteate; seeds 1, 2-seriate. (REICHB., *op. cit.*, ii. t. 73.)

10. *Psilostylum* (DC., sect. iii.). Siliquas subterete; style slender. Calyx closed. Petals yellow. (DELESS., *Ic. Sel.*, ii. t. 63, fig. 1.)

11. *Alliaria* (ADANS., *Fam. des Pl.*, ii. 418.—DC., *Syst. Veg.*, ii. 488; *Prodr.*, i. 196.—SPACH, *Suit. à Buffon*, vi. 413.—ENDL., *Gen.*, 875). Siliqua elongated. Flowers white. Leaves entire, cordate or deltoid. Seeds striate. Species 2, 1 Himalayan, 1 European and Asiatic. (ŒD., *Fl. Dan.*, t. 935.—SCOP., *Fl. Carniol.*, 515.—REICHB., *op. cit.*, ii. t. 60.)

12. *Eutrema* (R. BR., in *Parr. Voy. App.*, 267, t. A.—ENDL., *Gen.*, n. 4924. — HOOK. F., in *Journ. Linn. Soc.*, v. 164.—B. H., *Gen.*, 78, n. 50). Siliqua linear oblong terete; valves convex costate. Seeds few. Perennial herbs; stems simple, few-flowered; flowers subcorymbose (white); radical leaves long-petiolate, oblong or cordate, entire or serrate; cauline subsimilar or sessile. (Spec. 5, 3 Siberian and Arctic, 2 from mountains of Asia. LEDEB., *Ic. Fl. Ross.*, t. 258.—WALP., *Rep.*, i. 174.)

[1] Spec. about 90. DELESS., *Ic. Sel.*, ii. t. 63, 64.—FOURN., *Thès. Cit.*, 54.—BOISS., *Fl. Or.*, i. 212 (*Alliaria*), 213.—TRIANA & PL., in *Ann. Sc. Nat.*, sér. 4, xvii. 63.—EICHL., in *Mart. Fl. Bras.*, *Crucif.*, 303. — GRISEB., *Fl. Brit. W. Ind.*, 13.—GREN. & GODR., *Fl. de Fr.*, i. 92.—WALP., *Rep.*, 163; ii. 760; v. 39; *Ann.*, i. 40; ii. 48; iv. 209; vii. 133.

[2] *Ic. Fl. Germ.*, ii. t. 61 (part.). — ENDL., *Gen.*, n. 4908 e.—B. H., *Gen.*, 78, n. 51.

[3] Very variable in form, and usually a deceptive character.

cylindrical; stigmatiferous apex cleft or 2-lobed; valves flat or convex, sometimes torulose, 1–3-ribbed; septum membranous or spongy. Seeds ∞, 1-seriate oblong, glabrous or with very thin wrinkles, not marginate; embryo sometimes herbaceous; cotyledons incumbent sometimes concave, subconduplicate.—Annual or 2-ennial herbs, glabrous, often glaucous; leaves simple entire; cauline oblong auricled-amplexicaul; flowers[1] racemose ebracteate (*West Asia, South Europe*[2]).

23. **Erysimum** L.[3]—Flowers of *Cheiranthus;* siliqua elongated, subterete, or sub-4-gonous, rather compressed; style short or more or less elongated; apex stigmatose capitate, emarginate or 2-lobed; valves usually carinate, 1-ribbed; septum more or less membranous; style short or elongated, apex stigmatose capitate, emarginate or 2-lobed. Seeds ∞, 1-seriate oblong, immarginate or at apex marginate or apiculate; funicles thin free; embryo fleshy cotyledons accumbent.—Biennial or perennial herbs, often hoary with appressed (2-partite) hairs, sometimes laxly pilose or hairy-tomentose; leaves alternate narrow,[4] linear or oblong, entire sinuate dentate or rarely pinnatifid; flowers[5] in usually elongated ebracteate racemes[6] (*Mountains of South Europe, the East, Central Asia, North America*[7]).

24? **Porphyrocodon** Hook. f.[8]—Sepals erect unequal; 2 a little

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[1] Yellow or golden.

[2] Spec. 6. DC., *Prodr.*, i. 199 (*Erysimum*).—Boiss., *Fl. Or.*, i. 209.—Walp., *Rep.*, i. 169; *Ann.*, vii. 138.

[3] L., *Gen.*, n. 814 (nec T.).—Adans., *Fam. des Pl.*, ii. 418.—J., *Gen.*, 239.—DC., *Prodr.*, i. 169.—Endl., *Gen.*, n. 4908.—A. Gray, *Gen. Ill.*, t. 6.—B. H., *Gen.*, 79, n. 54.

[4] Neither cordate-amplexicaul nor pinnatisect.

[5] Rather large, golden, or rarely purple, often scented.

[6] The genus is scarce to be distinguished from *Sisymbrium* by certain characters. *Alliaria* comes between them. It is also closely allied to *Cheiranthus* (sect. *Cheiri*), differing mainly in its usually accumbent cotyledons. According to B. H. (*loc. cit.*), "The following sections are made by modern botanists, but appear to be very uncertain: 1. *Agonolobus* (C. A. Mey.). Siliqua subterete; valves and replum rounded at the back. (Reichb., *Ic. Fl. Germ.*, ii. t. 68).—2. *Cuspidaria* (DC.). Siliqua double; valves carinate-compressed.—3. *Cheiropsis* (C. A. Mey.). Siliqua compressed-4-gonous; valves and replum acutely carinate. (Reichb., *loc. cit.*, t. 63).—4. *Erysimastrum* (C. A. Mey.). Siliqua 4-gonous; valves and replum subprominent carinate. (Reichb., *loc. cit.*, t. 63.—Deless., *Ic. Sel.*, ii. t. 66, 67.)" To this genus the same authors refer *Strophades* (Boiss., in *Ann. Sc. Nat.*, sér. 2, xvii. 73.—Walp., *Rep.*, i. 171), a rigid silvery Mesopotamian herb, with narrow linear leaves, much elongated fruiting racemes, purple petals, a distinct rigid subulate style, a terete twisted siliqua laterally compressed.

[7] Species made by authors upwards of 100, but should, perhaps, be reduced to 15–20. Deless., *Ic. Sel.*, ii. t. 65–67.—Boiss., *Fl. Or.*, i. 186.—Eichl., in *Mart. Fl. Bras.*, *Crucif.*, 304.—Gren. & Godr., *Fl. de Fr.*, i. 87.—Walp., *Rep.*, i. 167; ii. 761; *Ann.*, i. 42; ii. 48; iv. 210; vii. 139.

[8] *Gen.*, 79, n. 52.

shorter. Petals large erect long-unguiculate. Stamens 6, free toothless inserted on much thickened shortly clavate glandular receptacle. Siliqua linear-elongated subcompressed tapering at both ends; style slender much elongated, exserted: apex stigmatose capitate 2-lobed; valves nearly flat 1-ribbed; septum membranous. Seeds ∞, 1-seriate compressed immarginate, funicles filiform.—A tall branching glabrous herb; leaves imparipinnatisect; leaflets unequal at base, falsely-pedicellate unequally toothed; flowers[1] long-pedicellate, in bracteate racemes; bracts leafy[2] (*Venezuela, New Granada*[3]).

25. **Smelowskia** C. A. Mey.[4]—Flowers nearly of *Erysimum*; sepals short lax, equal at base. Siliqua rather short, tapering at both ends, either laterally compressed or sub-4-gonous; style short; apex minutely capitate stigmatiferous; replum filiform included. Septum membranous; valves concave submembranous. Seeds few; 1-seriate immarginate; funicles free.—Perennial herbs, subcæspitose, hoary tomentose; leaves pinnati- or 2-pinnatisect; flowers[5] racemose ebracteate[6] (*Siberia, Rocky Mountains*[7]).

26. **Zerdana** Boiss.[8]—Sepals erect elongated, subequal at base. Petals long-unguiculate. Stamens 6, 4-dynamous; the larger ones connate in pairs half way up. Siliqua linear rather compressed sublinear subtorulose; valves subcarinate veined; septum membranous, sub-2-costate; style subulate; apex stigmatose, 2-lobed. Seeds ∞, 1-seriate oblong; funicles filiform free.—A perennial cæspitose herb, hoary all over with glandular hairs; rhizome elongated, double or multiple; leaves all radical, rosulate subspathulate-obtuse; flowers[9] crowded at apex of simple scapes bare at base (*Alpine Persia*[10]).

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1 Purple, large nodding.

2 A genus very near *Cardamine*.

3 Spec. 1. *P. pictum*. — *Cardamine picta* Hook., in *Hook. Journ.*, vi. 292, t. 12.—Triana & Pl., in *Ann. Sc. Nat.*, sér. 4, xvii. 59, n. 1.—Walp., *Ann.*, i. 303.

4 In *Ledeb. Fl. Alt.*, iii. 165.—Endl., *Gen.*, n. 4910.—B. H., *Gen.*, 79, n. 53.

5 White or yellow, usually small.

6 "An anomalous genus, which, perhaps, needs breaking up, and is intermediate between *Sisymbrium, Eutrema, Draba*, and *Capsella*, by *S. calycina* and others; it also approaches *Parrya* by *P. Ermani* (*Draba parryoides* Erm.). In *S. calycina* the siliqua is very variable, sometimes 4-gonous, sometimes laterally compressed, short or elongated." (B. H., *loc. cit.*)—According to Fourn. (in *Bull. Soc. Bot. de Fr.*, x. 7), *B. arthrocarpa* Wedd. approaches *Smelowskia* in flower and fruit.

7 Spec. about 4 (3 Siberian). Ledeb., *Ic. Fl. Ross.*, t. 151.—Walp., *Rep.*, i. 171; *Ann.*, vii. 139.

8 In *Ann. Sc. Nat.*, sér. 2, xvii. 84.—B. H., *Gen.*, 80, n. 55.

9 Yellow.

10 Spec. 1. *Z. anchonioides* Boiss., *loc. cit.*; *Fl. Or.*, i. 239.—Walp., *Rep.*, i. 173.

27. **Christolea** CAMBESS.[1]—Sepals suberect; lateral saccate at base. Petals long-tapering at base. Stamens 6, free 4-dynamous. Siliqua linear-lanceolate, much flattened; style very short; apex entire minutely capitate subconical stigmatiferous; valves flat, 1-ribbed; septum membranous ribless. Seeds ∞, 1-seriate compressed immarginate; embryo rather fleshy; cotyledons incumbent linear.—A herb (perennial) pubescent-tomentose, or subglabrous; branches diffuse prostrate or ascending, leafy; leaves alternate sessile, obovate cuneate rather thick entire or large-toothed; flowers[2] in lax ebracteate racemes (*Alpine Thibet*[3]).

28. **Greggia** A. GRAY.[4]—Sepals linear patulous, equal at base. Petals narrowed-unguiculate at base. Stamens 6, toothless. Disk external to androceum, continuous unequally lobed. Siliqua linear, compressed across septum, hoary; style slender erect; apex thickened, cordate-2-lobed, stigmatose; valves orbicular-conduplicate, thinly 1-ribbed. Seeds ∞, 1-seriate subovate turgid immarginate; funicles free.—A low undershrub, hoary with short stellate down; branches diffuse; leaves spathulate, repand-dentate or sinuate; flowers[5] in lax racemes; pedicels slender, elongated when fruiting[6] (*Texas, New Mexico*[7]).

29. **Syrenia** ANDRZ.[8]—Flowers nearly of *Cheiranthus* or *Erysimum*; lateral sepals saccate at base. Siliqua short or elongated, linear straight rigid, sub-4-gonous or laterally compressed; style elongated subulate; apex stigmatose, capitate or 2-lobed,[9] papillose internally; valves saccately carinate; dorsal rib thick; septum thin opaque or rather thick, 1-ribbed, sometimes excavated.[10] Seeds ∞, 1, 2-seriate oblong immarginate; funicles setaceous.—Branching 2-ennial herbs;

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1 In *Jacquem. Voy. Bot.*, 17, t. 17.—ENDL., *Gen.*, n. 4914.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 167.—B. H., *Gen.*, 80, n. 58.

2 Yellow.

3 Spec. 1. *C. crassifolia* CAMBESS., *loc. cit.*—WALP., *Rep.*, i. 172.

4 *Pl. Wright.*, i. 8, t. 1 (nec GÆRTN., nec ENGELM.).—B. H., *Gen.*, 80, n. 56.

5 White.

6 "A genus with habit, &c., of *Erysimum*, and siliqua of *Syrenia*, but probably more closely allied to *Synthlaspi* and *Lyrocarpa*." (B. H., *loc. cit.*)

7 Spec. 1. *G. camporum* A. GRAY, *loc. cit.*—WALP., *Ann.*, iv. 208.

8 Ex LEDEB., *Fl. Alt.*, i. 162.—ENDL., *Gen.*, n. 4918.—B. H., *Gen.*, 80, n. 57.

9 Elongated lobes of *Zerdana* in *S. cuspidata*. *S. cornuta* GAY takes its name from its subarcuate reflexed lobes, stigmatiferous within.

10 Form of siliqua rather variable in *S. siliculosa*.

flowers[1] racemose, ebracteate, or lower ones bracteate (*South Russia, the East, Siberia*[2]).

30. **Pachypodium** NUTT.[3]—Sepals elongated, equal at base or lateral slightly saccate. Petals much elongated-contracted. Stamens 6, 4-dynamous; anthers elongated twisted. Siliqua raised on a short thick gynobase, rather short or elongated torulose; style short; stigmatose apex capitate or emarginate; valves convex, with a prominent rib; septum hyaline, slightly thickened at middle or ribless. Seeds ∞, more rarely few, 1-seriate oblong; embryo rather fleshy; cotyledons obliquely incumbent; funicles free slender.—Annual or 2-ennial robust glabrous herbs; leaves entire laciniate or pinnatifid; flowers[4] in elongated racemes or dense corymbs, ebracteate[5] (*California*[6]).

31. **Stanleya** NUTT.[7]—Sepals equal at base, spreading. Petals narrow elongated long-unguiculate. Anthers elongated, finally twisted. Siliqua long-stipitate,[8] much elongated slender, 4-gonous-subterete rather compressed; style very short or nearly absent; stigmatose apex entire; valves carinate 1-ribbed; septum membranous. Seeds ∞, 1-seriate descending oblong subterete; funicles slender free.—Glabrous glaucous perennial herbs;[9] leaves simple entire or pinnatifid; flowers[10] in elongated straight multifloral racemes, ebracteate (*California*[11]).

32? **Warea** NUTT.[12]—Flowers nearly of *Stanleya*; sepals short. Petals rather broad, narrowed at base but not unguiculate. Siliqua decurved or pendulous, long-stipitate[13] slender compressed; style 0;

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[1] Golden, rather large.

[2] REICHB., *Ic. Fl. Germ.*, ii. t. 71.—BOISS., *Fl. Or.*, i. 209.

[3] NUTT., in *Torr. & Gr. Fl. N.-Amer.*, i. 96 (nec WEBB).—ENDL., *Gen.*, n. 4915.—B. H., *Gen.*, 81, n. 61.—*Thelypodium* ENDL., *Gen.*, n. 4915.

[4] Pink or pale purple.

[5] From this genus we can scarcely distinguish (according to A. GRAY, in *Proceed. Amer. Acad.*, vi. 188), *Iodanthus* TORR. & GR., *Fl. N.-Am.*, i. 72.—DC., *Prodr.*, i. 149.—A. GRAY, *Gen. Ill.*, t. 54.—B. H., *Gen.*, 70, n. 15. (*Hesperis pinnatifida* MICHX.).

[6] Spec. 4. HOOK., *Bot. Misc.*, 341, t. 68; *Beech. Voy. Bot.*, t. 74 (*Macropodium*).—WALP., *Rep.*, i. 172.

[7] *Gen.*, ii. 21.—DC., *Prodr.*, i. 200.—ENDL., *Gen.*, n. 4916.—A. GRAY, *Gen. Ill.*, t. 65.—B. H., *Gen.*, 80, n. 59.

[8] Nearly as in *Cleome*.

[9] Habit of *Arabis*.

[10] Yellow.

[11] Spec. about 6. TORR., in *Sitgr. Rep.*, 155, t. 1.—WALP., *Rep.*, ii. 173; *Ann.*, vii. 143.

[12] In *Journ. Acad. Philad.*, vii. 83, t. 10.—ENDL., *Gen.*, n. 4917.—A. GRAY, *Gen. Ill.*, t. 66.—B. H., *Gen.*, 80, n. 60.

[13] Nearly as in *Cleome*.

stigma emarginate; valves nearly flat thin 1-ribbed; septum hyaline ribless. Seeds ∞, 1-seriate; funicles free; cotyledons obliquely incumbent or accumbent.—An erect annual branching glabrous herb; branches slender; leaves entire sessile; flowers[1] in racemes, subcorymbose when fruiting (*Florida*[2]).

33? **Streptoloma** BGE.[3]—"Sepals short spreading equal at base. Stamens free, short; longer externally appendiculate at base; shorter sublobulate at base on both sides. Siliqua elongated thin longitudinally twisted constricted between seeds; valves obsoletely 1-ribbed; septum hyaline; stigma sessile 2-lobed. Seeds 1-seriate pendulous granulate; funicles setaceous free.—A very thin and low annual herb, setulose with 2-partite hairs; leaves entire, narrowly spathulate; radical subdentate; flowers[4] racemose, few, ebracteate" (*Caspian*[5]).

34. **Dontostemon** ANDRZ.[6]—Flowers nearly of *Malcolmia*; sepals short, equal at base, sometimes glandular. Petals tapering at base. Stamens 6; longer connate in pairs. Siliqua subterete elongated; style short; stigmatose apex entire or subemarginate; valves convex, sub-3-costate; septum membranous. Seeds ∞, 1-seriate, marginate or emarginate; cotyledons linear, incumbent or oblique; funicles free.—Herbs, branching erect slender; hairs simple glandular or branching; leaves entire or pectinate-pinnatifid; flowers[7] in ebracteate racemes (*Mongolia*, *Mantchooria*, *Siberia*[8]).

35? **Lepidostemon** HOOK. F. & THOMS.[9]—"Sepals short patulous, equal at base. Stamens free, each with a broad membranous appendage. Siliqua (rather young) linear-elongated subterete hoary; valves rather flat; septum hyaline; style rather short. Seeds 1-seriate oblong compressed; funicle slender free.—A conspicuous annual herb, small pubescent-tomentose; stem short simple,

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[1] White, lilac, or pink.

[2] Spec. 1. *W. cuneifolia* NUTT., *loc. cit.*—TORR. & GR., *Fl. N.-Amer.*, i. 98.—*Cleome cuneifolia* MUEHL.

[3] In *Arb. Naturf. Ver. Rig.*, i. 155; *Enum. Pl. Lehman.*, 31, t. 4.—B. H., *Gen.*, 77, n. 48 (whence we take the description).

[4] "Very small, white."

[5] Spec. 1. *S. desertorum* BGE., *loc. cit.*—WALP., *Ann.*, i. 40; vii. 128.

[6] In *DC. Prodr.*, i. 190.—ENDL., *Gen.*, n. 4904.—B. H., *Gen.*, 77, n. 46.

[7] Small; white, pink, pale-purple, or violet.

[8] Spec. 7. LEDEB., *Ic. Fl. Ross.*, t. 203, 353.—BGE., *Pl. Lehm.*, 202.—BOISS., *Fl. Or.*, i. 226.—WALP., *Rep.*, i. 163; *Ann.*, i. 39.

[9] In *Journ. Linn. Soc.*, v. 156.—B. H., *Gen.*, 77, n. 47 (whence the description is taken).

densely leaved; leaves crowded linear dentate; flowers[1] on very long fascicled subcorymbose pedicels, ebracteate (*Eastern Himalayas*[2]).

36. **Malcolmia** R. Br.[3]—Sepals linear erect; lateral often a little broader, gibbous at base. Stamens 6, longer filaments free or connate in pairs. Glands 4, minute; placentary pair external to stamens; carpellary internal. Siliqua subterete, elongated or cylindrical-subulate, usually thick-pedunculate; valves 3-ribbed; replum obtuse or very slightly prominent; septum membranous; style short cylindrical; lobes of stigmatose apex connate or connivent into an erect cone, more rarely decurrent down style. Seeds 1-seriate, or 2-seriate at base of fruit (*Strigosella*[4]), oblong or globular, immarginate or winged (*Cremobium*); embryo fleshy; cotyledons incumbent.—Branching herbs, often covered with stellate hairs; branches often prostrate; leaves alternate, entire or pinnatifid; flowers[5] laxly racemose, ebracteate (*North-west India, Persia, Caspian, Mediterranean, North Africa*[6]).

37. **Hesperis** T.[7]—Sepals (sometimes coloured) erect; lateral gibbous at base. Petals rather thick, unguiculate. Stamens free; filaments sometimes dilated at base. Siliqua elongated subterete or sub-4-gonous; valves[8] rather flat, keeled, sub-3-costate, sometimes slightly contracted between seeds; replum more or less carinate; septum membranous,[9] excavated beside seeds; style short; apex stigmatose 2-lobed; lobes ovate-elliptical erect[10] (alternating with septum). Seeds oblong, immarginate or marginate, when young alternately imbricate and pendulous from top of ascending funicle, when mature descending with free funicle; embryo fleshy; cotyledons

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[1] Golden.

[2] Spec. 1. *L. pedunculosus* Hook. f. & Thoms., *loc. cit.*

[3] In *Ait. Hort. Kew.*, ed. 2, iv. 121.—DC., *Prodr.*, i. 186.—Spach, *Suit. à Buffon*, vi. 392.—Endl., *Gen.*, n. 4902.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 155.—B. H., *Gen.*, 77, n. 45.—*Eremobium* Boiss., *Fl. Or.*, i. 156.

[4] Boiss., *Diagn. Pl. Or.*, ser. 2, iv. 22.

[5] White, lilac, or purple.

[6] Spec. about 20. Reichb., *Ic. Fl. Germ.*, ii. t. 56, 57.—Deless., *Ic. Sel.*, ii. t. 59, 60.—Boiss., *Fl. Or.*, i. 221.—Gren. & Godr., *Fl. de Fr.*, i. 83.—Walp., *Rep.*, i. 161; ii. 760; *Ann.*, i. 39; vii. 131, 132 (*Strigosella*).

[7] *Inst.*, 222, t. 108.—L., *Gen.*, n. 817.—Adans., *Fam. des Pl.*, ii. 418.—J., *Gen.*, 238.—DC., *Prodr.*, i. 188.—Spach, *Suit. à Buffon*, vi. 388.—Endl., *Gen.*, n. 4903.—B. H., *Gen.*, 76, 966, n. 44.—*Kladnia* Schur, *Enum. Pl. Transylv.*, 53.

[8] Subseptiferous in *H. triste* L., which is the genus *Deilosma* Spach (*Suit. à Buffon*, vi. 397).

[9] Rather thick in *H. renifolia* Boiss., which is the genus *Chalcanthus* Boiss. (*Fl. Or.*, i. 211).

[10] Wherein the genus often recalls *Matthiola*; but the lobes are very short in *H. renifolia* Boiss. (*Chalcanthus renifolius* Boiss., *Fl. Or.*, i. 212), and divaricated in *H. speciosa*.

incumbent, or more rarely obliquely accumbent.[1]—Erect herbs, 2-ennial or perennial at base, covered with simple forked or glandular hairs; flowers[2] in lax ebracteate racemes (*Europe, the East, Siberia*[3]).

38. **Tetracme** BGE.[4]—Sepals short equal at base. Petals short unguiculate, rather broad. Stamens 6, toothless short. Siliqua short, sometimes sub-4-gonous; stigma subsessile 2-lobed; replum saccate at base; valves convex, 3-costate; 4 lateral ribs submarginal rather thick, at apex produced into an arcuate corona. Septum hyaline. Seeds few, 1-seriate immarginate; cotyledons incumbent, oblique to septum.—Herbs, covered with forked hairs; leaves oblong or linear; flowers[5] in short racemes; fruits (appressed at base to rachis) in spikes (*Afghanistan, Caspian*[6]).

39. **Schizopetalon** SIMS.[7]—Sepals subequal at base, erect. Petals long-unguiculate; limb unequally pinnatifid; præfloration involute-imbricate. Stamens 6, 4-dynamous, toothless. Glands of disk 6, compressed-subulate, erect. Siliqua narrowly linear, more or less compressed, unequally thickened; valves rather flat, veined; septum more or less sinuate, hyaline; ovules ∞, 1–2-seriate; style short or obsolete, stigmatiferous 2-lobed at apex; lobes erect long-connate. Seeds ∞, 1- or more rarely 2-seriate, oblong or globose; embryo rather fleshy; radicle cylindrical slender; cotyledons incumbent, straight or 2–3-fid; lobes linear, spirally contorted or convolute.—Erect annual herbs, sometimes branching, hoary with branching down; leaves alternate, unequally toothed or pinnatifid; flowers[8] in terminal racemes; bracts leafy (*Chili*[9]).

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[1] Certainly incumbent in *Clausia* (TROTZKY, *Ind. Sem. Hort. Casam.* (1839), ex WALP., *Rep.*, ii. 755.—DELESS., *Ic. Sel.*, ii. 62), which has winged seeds (perhaps a species of *Cheiranthus* ?).

[2] Rather large, variegated, sometimes scented.

[3] Spec. about 20. DELESS., *op. cit.*, ii. t. 6.—REICHB., *Ic. Fl. Germ.*, ii. t. 57–59.—BOISS., *Fl. Or.*, i. 211, 230.—GREN. & GODR., *Fl. de Fr.*, i. 82.—WALP., *Rep.*, i. 160; v. 38; *Ann.*, i. 39; ii. 47; vii. 129.

[4] In *Linnæa*, xii. Litt., 71.—ENDL., *Gen.*, n. 4909.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 154.—B. H., *Gen.*, 76, n. 42.

[5] White, small.

[6] Spec. 2. TRAUTV., *Imag.*, t. 21.—BOISS., *Fl. Or.*, i. 316.—WALP., *Rep.*, i. 171; *Ann.*, i. 43; vii. 129.

[7] In *Bot. Mag.*, t. 2379.—DC., *Prodr.*, i. 236.—SPACH, *Suit. à Buffon*, vi. 386.—ENDL., *Gen.*, n. 4980.—B. H., *Gen.*, 76, n. 43.—*Perreymondia* BARN., in *Ann. Sc. Nat.*, sér. 3, iii. 168.

[8] Purple or white.

[9] BARN., in *C. Gay Fl. Chil.*, i. 144.—WEDD., *Chlor. Andina*, t. 86 E (*Perreymondia*).—HOOK. *Exot. Fl.*, t. 74.—PHIL., in *Linn.*, xxviii. 668.—WALP., *Rep.*, i. 192; v. 51; *Ann.*, vii. 129.

40. **Heliophila** L.[1]—Sepals equal or subequal at base. Stamens 6; lateral sometimes with a tooth at base. Siliqua very variable in form, sessile or stipitate, indehiscent or dehiscent; edges straight or sinuate constricted between seeds; valves flat, 1–3-ribbed; septum hyaline; style short, robust or elongated; apex stigmatose, discoidal subentire or 2-lobed. Seeds few or ∞, 1–2-seriate, immarginate or winged; embryo fleshy elongated; cotyledons transversely 2-plicate, incumbent or accumbent on cylindrical radicle.—Herbs, annual or perennial at base, glabrous or pubescent, more rarely branching undershrubs; leaves entire dentate sinuate pinnatisect or multifid; flowers[2] racemose; pedicels usually very slender, ebracteate[3] (*South Africa*[4]).

41? **Chamira** THUNB.[5]—Sepals unequal at base; lateral saccate. Stamens 6, free. Siliqua very shortly stipitate, oblong compressed; valves rather flat striate; style subulate. Seeds few, 1-seriate, ovate-compressed; testa rather thick, soft; embryo rather fleshy (coloured); cotyledons transversely 2-plicate; radicle slender.—A glabrous annual herb; inferior leaves subopposite sessile; superior alternate smaller cordate petiolate; flowers[6] few, in terminal racemes (*West of South Africa*[7]).

c. BRASSICINEÆ.—*Cotyledons usually incumbent.*

42. **Brassica** T.—Sepals erect or spreading, equal or lateral more often saccate at base. Petals unguiculate. Stamens 6, 4-dynamous; filaments free toothless. Hypogynous glands 4, superposed to petals.

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[1] *Gen.*, n. 816.—J., *Gen.*, 238.—DC., *Prodr.*, i. 231.—ENDL., *Gen.*, n. 4978.—SOND., *Rev. Heliophil.*, t. 18–28, in *Abh. Aus. d. Gebiet. d. Naturw.*, i. 180.—B. H., *Gen.*, 81, 967, n. 62.—*Trentepohlia* ROTH, *Cat. Nov. Pl. Spec.*, 325.

[2] White, bluish pink, or yellow; sometimes handsome.

[3] The following 6 sections have been made, scarcely well limited, by ECKLON and ZEYHER (*Enum.*), and most of them have been raised to distinct genera: 1. *Lanceolaria* (DC.). Siliqua lanceolate. Glabrous shrubs.—2. *Leptormus* (ECKL. & ZEYH., *loc. cit.*, 8). Siliqua linear moniliform; joints oval. Herbs.—3. *Ormiscus* (ECKL. & ZEYH., *loc. cit.*, 9). Siliqua of *Leptormus*; joints globular. Herbs.—4. *Selenocarpæa* (ECKL. & ZEYH., *loc. cit.*, 10). Siliqua oval or suborbicular. Herbs.—5. *Pachystylum* (ECKL. & ZEYH., *loc. cit.*, 13). Siliqua linear; style short robust. Pubescent undershrubs.—6. *Orthoselis* (SPACH, *Suit. à Buffon*, vi. 453). Siliqua linear; margins straight. Herbs or shrubs.

[4] Spec. about 40, but raised to 60–70 by various authors. DELESS., *Ic. Sel.*, ii. t. 96–99.—HARV. & SOND., *Fl. Cap.*, i. 35.—HARV., *Thes. Cap.*, t. 166.—*Bot. Mag.*, t. 2526.—WALP., *Rep.*, i. 190; *Ann.*, i. 51; vii. 143.

[5] *Nov. Gen.*, ii. 48.—DC., *Prodr.*, i. 231.—ENDL., *Gen.*, n. 4979.—SOND., *Rev. Helioph.*, 269, t. 29.—HARV. & SOND., *Fl. Cap.*, i. 32.—B. H., *Gen.*, 81, n. 63.

[6] White, small.

[7] Spec. 1. *C. cornuta* THUNB.

Siliqua elongated, subterete or 4-gonous; style more or less elongated; apex rostrate or ensiform, persistent as a rostrum or deciduous from top of siliqua; rostrum sometimes indehiscent, often 1-seeded; stigmatiferous apex truncate or 2-lobed. Seeds ∞, usually 1-seriate, more rarely (*Diplotaxis*) 2-seriate, immarginate, subglobose ovoid or oblong; funicles setaceous free; embryo rather fleshy (sometimes coloured); cotyledons conduplicate, or more or less concave longitudinally.—Small shrubs or more frequently herbs, usually erect, branching, 2-ennial or perennial; root or stem dilated, succulent; leaves glabrous glaucous, or more rarely pilose or hoary; radicle pinnatifid; flowers in elongated leafless ebracteate simple or branched racemes (*Europe, North and Subtropical Africa, and Asia*). See p. 185.

43. **Eruca** T.[1]—Flowers nearly of *Brassica*; lateral sepals saccate or subsaccate at base. Siliqua oblong subterete turgid; rostrum broadly ensiform, aspermous; valves concave inside, 3-costate; septum membranous; stigmatose apex of style simple or scarcely 2-lobed. Seeds ∞, 2-seriate subglobose; funicles free. Other parts of *Brassica*.—Annual or 2-ennial erect branching herbs; leaves pinnatifid; flowers[2] racemose ebracteate; pedicels slender (*Europe, West Asia*[3]).

44. **Savignya** DC.[4]—Sepals erect, subequal at base. Stamens free, toothless. Placentary glands erect, produced. Siliqua elliptical orbiculate; style slender produced; apex stigmatose capitate; valves submembranous, rather convex, net-veined; septum hyaline, 2-lamellate. Seeds ∞, or few, 1–2-seriate compressed suborbiculate; margin broadly membranous-alate; funicles slender unequal, half-adnate.—A quite glabrous branching undershrub; branches thin terete; leaves entire or pinnatifid; flowers[5] in slender terminal and leaf-opposed racemes; pedicels long-filiform, often decurved (*North Africa, Arabia*[6]).

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[1] *Inst.*, 226, t. 111.—DC., *Syst.*, ii. 636; *Prodr.*, i. 223.—SPACH, *Suit. à Buffon*, vi. 352.—ENDL., *Gen.*, n. 4951.—B. H., *Gen.*, 84, 967, n. 79.—*Euzomum* LINK, *Enum.*, ii. 174.

[2] Variegated, reticulate with dark-purple veins.

[3] Spec. 3. L., *Spec.*, 932 (*Brassica*).—REICHB., *Ic. Fl. Germ.*, ii. t. 84.—BOISS., *Diagn.*, ii. 5, 26; 6, 13; *Fl. Or.*, i. 395.—GREN. & GODR., *Fl. de Fr.*, i. 74.—WALP., *Ann.*, iv. 219; vii. 151.

[4] *Syst. Veg.*, ii. 283; *Prodr.*, i. 157.—ENDL., *Gen.*, n. 4961.—B. H., *Gen.*, 85, n. 81.

[5] Pink or violet.

[6] Spec. 1 (?). *S. longistyla* BOISS. & REUT.,

45. **Euzomodendron** Coss.[1]—Sepals erect; lateral saccate at base. Stamens 6, longer 4 connate in pairs. Siliqua linear oblong, or elongated lanceolate compressed; beak ensiform, much compressed; apex stigmatose 2-lobed; valves convex coriaceous multicostate; septum membranous hyaline. Seeds ∞, 1-seriate compressed, girt by a broad soft membranous wing; embryo coloured; cotyledons conduplicate; radicle cylindrical ascending; funicles setaceous, half adnate to septum.—A glabrous branching undershrub; branches terete; leaves alternate pinnatilobate; flowers[2] in terminal racemes (*Spain*[3]).

46. **Henophyton** Coss. & Dur.[4]—Sepals erect; lateral saccate at base. Siliqua[5] broadly linear, nearly flat, beaked by erect style in flower (2 lobes of stigmatiferous apex connate-conical); margin straight or subsinuate; valves flat shining submembranous, with 1 median rib; veins anastomosing; septum membranous-winged; funicles adnate to septum.—An erect glabrous branching undershrub; stems and branches terete, finally white; leaves alternate linear, entire or subsinuate, rather fleshy; flowers[6] in lax terminal racemes; pedicels long ebracteate (*East Algeria*[7]).

47. **Moricandia** DC.[8]—Sepals erect; lateral very saccate at base. Stamens of *Brassica*. Placentary glands usually minute or 0. Siliqua linear elongated, erostrate (or with compressed, sometimes 1-seeded, rostrum); valves carinate or flat; septum thin membranous; style rather short; stigmatose lobes connate into an erect rather compressed cone. Seeds 1-seriate (*Douepea*[9]), or 2-seriate, immarginate marginate or winged (*Douepea*).—Herbs or small shrubs, glabrous glaucous; leaves entire or pinnatisect, usually amplexicaul; flowers[10] rather large (*South Europe, North Africa, West Asia*[11]).

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in *Boiss. Diagn. Or.*, sér. 2, v. 27.—Boiss., *Fl. Or.*, i. 396.—Walp., *Ann.*, ii. 54; vii. 153.—*S. ægyptiaca* Coss., in *Balans. Exs. Alg.*, n. 887.—*Lunaria parviflora* Del., *Fl. d'Egypte*, t. 55, fig. 3.

[1] In *Webb. Ot. Hispan.*, 47, t. 43.—B. H., *Gen.*, 85, n. 80.

[2] Lilac.

[3] Spec. 1. *E. Bourgæanum* Coss., *loc. cit.*

[4] In *Bull. Soc. Bot. de Fr.*, ii. 246, 625: in *Ann. Sc. Nat.*, sér. 5, i. 279, t 22 (*Henonia* prius).—B. H., *Gen.*, 85, 967, n. 84 (excl. syn.).

[5] Recalling that of *Farsetia*.

[6] Rather large, purple.

[7] Spec. 1. *H. deserti* Coss., *loc. cit.*—Walp., *Ann.*, iv. 216; vii. 154.

[8] *Syst. Veg.*, ii. 626; *Prodr.*, i. 221.—Spach, *Suit. à Buffon*, vi. 383.—Endl., *Gen.*, n. 4954.—B. H., *Gen.*, 85, n. 82.—*Oudneya* R. Br., in *Denh. et Clapp. Narr. App.*, 220 (ex Coss., in *Bull. Soc. Bot. de Fr.*, xii. 280).

[9] Cambess., in *Jacquem. Voy.*, *Bot.*, 18, t. 18.

[10] Pink or purple, rather large.

[11] Spec. about 5. Reichb., *Ic. Fl. Germ.*, ii. t. 90.—Boiss., *Fl. Or.*, i. 385.—Gren. & Godr., *Fl. de Fr.*, i. 82.—*Bot. Mag.*, t. 4947.—Walp., *Rep.*, i. 187; *Ann.*, ii. 54; iv. 217; vii. 153.

48. **Orychophragmus** BGE.[1]—Flowers nearly of *Moricandia;* siliqua very long, 4-gonous; beak compressed at apex, 4-gonous; style slender elongated; stigmatose apex conoidal; valves carinate; septum membranous, foveolate. Seeds ∞, 1-seriate immarginate, sub-3-quetrous.—An erect branching herb, glabrous glaucescent; leaves alternate; cauline sessile, entire, dentate, auriculate-2-lobed; radical lyrate pinnatifid; flowers[2] in lax ebracteate racemes (*North China*[3]).

II. RAPHANEÆ.

49. **Raphanus** L.—Sepals erect; lateral subsaccate at base. Petals unguiculate. Stamens 6, 4-dynamous; filaments free, toothless. Siliqua elongated terete, continuous, or more rarely moniliform, stipitate by a very short seedless joint (*Raphanistrum*), smooth or costate, coriaceous, suberous or fungous, internally continuous or made pluricellular by transverse septa; cells ∞, 1-seriate, sometimes alternating with empty ones in substance of pericarp; style slender; stigmatose apex emarginate. Seeds ∞, descending subglobose; embryo rather thick; cotyledons conduplicate, sometimes complicated. —Annual or 2-ennial herbs, branching, glabrous or hispidulous; root usually thickened, succulent; leaves alternate; inferior lyrate; flowers in elongated, terminal, or leaf-opposed, simple or branching, ebracteate racemes (*Europe, Temperate Asia*). See p. 193.

50. **Cryptospora** KAR. & KIR.[4]—Sepals erect, equal at base. Petals a little longer. Stamens free, toothless. Siliqua elongated, curved, subterete, inarticulate, indehiscent; style short; stigmatiferous apex subentire or emarginate; locelli 5, 6, distantly superposed, 1-seeded; intervals contracted. Seeds narrow, contracted; cotyledons elongated, incumbent.—An annual herb,[5] erect, branching from base, covered with forked hairs; leaves sessile, oblong, entire;

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[1] *Pl. Chin. Bor.*, 7.—ENDL., *Gen.*, n. 4953.—B. H., *Gen.*, 85, n. 83.

[2] Rather large, violet or lilac.

[3] Spec. 1. *O. sonchifolius* BGE., *loc. cit.*—WALP., *Rep.* i. 187.

[4] In *Bull. Mosc.* (1842), i. 160.—B. H., *Gen.* 101, n. 166.

[5] Aspect of *Malcolmia.*

flowers[1] in finally elongated racemes; pedicels short ebracteate, erect thickened when fruiting (*Songaria*[2]).

51. **Anchonium** DC.[3]—Sepals erect; lateral more or less saccate at base. Stamens 6, 4-dynamous; filaments of 4 longer connate in pairs. Siliqua patent or pendulous, elongated or short, subterete torulose, more or less contracted between seeds; septum rather thick undulate; locelli arranged in pairs or alternating; style conical, rostrate, subcompressed; stigmatose apex dilated, 2-lobed. Seeds solitary in locelli, broadly oblong or obovoid, descending, immarginate, glabrous; embryo coloured; cotyledons flat or concave, sometimes unequal; radicle cylindrical, incumbent.—Perennial herbs, tomentose with stellate or capitate-glandular hairs;[4] rhizome thick; leaves entire; radicle oblong, tapering at base; flowers[5] in leafy racemes; pedicels ebracteate, slender, scarcely thickened when fruiting[6] (*The East*[7]).

52 ? **Raffenaldia** Godr.[8]—Sepals erect, more or less coherent; lateral saccate at base. Siliqua elongated-4-gonous, unequally torulose, suberous, ∞-locellate by transverse processes; joints 1-seriate, 1-locellate, at maturity scarcely separating or persistent; style rather long, stigmatose at apex. Seeds descending, ovoid; embryo fleshy; cotyledons unequal, conduplicate.—A perennial subacaulescent herb; leaves densely rosulate, lyrate-imparipinnate; flowers solitary, pedunculate, subradical; peduncles erect, then deflexed, thickened when fruiting (*Algeria*[9]).

53. **Parlatoria** Boiss.[10]—Sepals subequal at base, spreading. Stamens 6, dilated at base; lateral 2 a little shorter, incurved. Siliqua

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1 White, minute.

2 Spec. 1, arenicolous. *C. falcata* Kar. & Kir., *loc. cit.*—Walp., *Rep.*, ii. 762.

3 *Syst. Veg.*, ii. 578; *Prodr.*, i. 212.—Endl., *Gen.*, n. 4945.—B. H., *Gen.*, 101, n. 167.

4 Habit of *Cheiranthus*.

5 Golden or purplish; handsome.

6 "A genus of doubtful affinities." (B. H., *loc. cit.*)

7 Spec. 2, 3. Deless., *Ic. Sel.*, ii. t. 82.—Boiss, *Fl. Or.*, i. 239.—Walp., *Rep.*, ii. 762.

8 *Fl. Juven.*, ed. 2, 52.—B. H., *Gen.*, 101, 165.—*Cossonia* Dur., in *Ann. Sc. Nat.*, sér. 3, xx. 82, t. 6.

9 Spec. 1. *R. primuloides* Godr., *loc. cit.*—Walp., *Ann.*, iv. 220.—*Cossonia africana* Dur., *loc. cit.*

10 In *Ann. Sc. Nat.*, sér. 2, xxii. 72.—B. H., *Gen.*, 102, n. 169.

elongated, subclavate or elongated, rather curved, at base articulated with clavate pedicel; style very short cylindrical; apex globular stigmatose. Seeds 1–5, linear, descending; testa spongy; embryo oblong; cotyledons incumbent; radicle cylindrical slender.—A branching annual herb; leaves long-petiolate, cordate-ovate, crenate-dentate or lobed; flowers[1] in terminal ebracteate racemes[2] (*West Asia*[3]).

54? **Goldbachia**[4] DC.—Sepals subequal at base, erect. Stamens 6, 4-dynamous toothless. Glands 4, alternipetalous. Siliqua subdrupaceous curved, 4-gonous; putamina 2, 3, separating more or less, 1-seeded; mesocarp thin subcoriaceous indehiscent; style compressed; stigmatose apex capitellate emarginate. Seeds oblong descending; funicle slender, rather long; embryo fleshy; cotyledons incumbent.—An annual erect herb; leaves entire glaucescent; lower petiolate; superior auriculate at base; flowers[5] in elongated racemes; pedicels slender ebracteate, decurved when fruiting[6] (*The East, North India*[7]).

55. **Chorispora** DC.[8]—Sepals elongated erect; lateral more or less gibbous at base. Petals long-unguiculate. Stamens 6, free, 4-dynamous. Siliqua straight patulous or curved, elongated cylindrical, lomentaceous, indehiscent; style elongated, with apex stigmatose erect, 2-lobed, finally persistent indurated subulate rostrate; pericarp rather spongy; cells ∞, 2-seriate, 1-seeded, sometimes alternating with empty ones in substance of fruit, often separating transversely on maturity from rather thick persistent replum into closed cells. Seeds descending, marginate or immarginate; radicle ascending; cotyledons incumbent or oblique.—Annual or perennial herbs, pilose or glandular; leaves entire or pinnatifid; flowers[9] in elongated

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1 Small, white.

2 A genus near *Sobolewskia*.

3 Spec. 1. BOISS., *Fl. Or.*, i. 244.—WALP., *Rep.*, i. 174; *Ann.*, vii. 179.

4 *Syst. Veg.*, ii. 576; *Prodr.*, i. 212.—ENDL., *Gen.*, n. 4944.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 180.—B. H., *Gen.*, 101, n. 168.

5 Small, violet.

6 "A genus very near *Isatis*, but as its 2-locellate stigma separates into cells, it scarcely seems to differ from the *Cakilineæ*." (HOOK. F., *loc. cit.*)

7 Spec. 1. *G. lævigata* DC., *loc. cit.*—DELESS., *Ic. Sel.*, ii. t. 81.—BOISS., *Fl. Or.*, i. 243.—*G. torulosa* DC., *loc. cit.*, n. 21.—*Raphanus lævigatus* BIEB., *Fl. Taur.*, ii. 129.

8 *Syst. Veg.*, ii. 435; *Prodr.*, i. 186.—R. BR., in *Ait. Hort. Kew.*, ed. 2, iv. 129.—ENDL., *Gen.*, n. 4900.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 181.—B. H., *Gen.*, 102, 968, n. 170.

9 Purple or pink.

racemes; pedicels rather long ebracteate, thickened when fruiting (*The East, North India*[1]).

56. **Sterigma** DC.[2]—Sepals erect, at base equal slightly contracted. Petals long-unguiculate. Stamens 6, 4-dynamous; filaments of longer connate in pairs half-way up or beyond. Siliqua elongated, more or less curved, subterete inarticulate subtorulose indehiscent; locelli ∞, 2-seriate; style short cylindrical; apex stigmatose; lobes 2, divaricated. Seeds descending smooth, immarginate or marginate; funicles slender free; embryo fleshy; cotyledons incumbent, flat or concave.—Perennial herbs, robust branching, stellate-tomentose, sometimes glandular-hispid; leaves entire or pinnatifid; flowers[3] in elongated racemes; pedicels rather thick ebracteate, spreading thickened when fruiting[4] (*The East, Siberia*[5]).

57? **Carponema** Eckl. & Zeyh.[6]—"Sepals 4, spreading, equal at base. Petals obovate-oblong; claw cuneate. Lateral stamens toothed at base. Siliqua pendulous sessile slender linear terete, tapering at both ends, indehiscent, ∞-locellate, contracted between seeds; locelli 2-seriate, separated by a membranous septum; alternate ones aspermous; style conical; stigma obtuse. Seeds ∞, 1-seriate oblong terete immarginate; cotyledons transversely 2-plicate.—An annual branching herb, glabrous or pilose; branches terete; leaves elongated linear; racemes elongated;[7] pedicels filiform, erect when flowering"[8] (*Cape of Good Hope*[9]).

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[1] Spec. about 7. Deless., *Ic. Sel.*, ii. t. 58.—Cambess., in *Jacquem. Voy.*, *Bot.*, t. 14.—Boiss., *Fl. Or.*, i. 143.—Walp., *Rep.*, i. 159; ii. 759; *Ann.*, iv. 207; vii. 179.

[2] *Syst. Veg.*, ii. 579; *Prodr.*, i. 212.—Endl., *Gen.*, n. 4946.—B. H., *Gen.*, 102, n. 171.—*Sterigmostemon* Bieb., *Fl. Taur.-Cauc.*, Suppl., 444.

[3] Rather large, yellow.

[4] "A genus probably most closely allied to *Hesperis*." (B. H., *loc. cit.*)

[5] Spec. 5. Deless., *Ic. Sel.*, ii. t. 83.—Boiss., *Fl. Or.*, i. 240.—Walp., *Rep.*, ii. 762.

[6] *Enum.*, 8.—Sond., *Revis. Helioph.*, 3, t. 17.—B. H., *Gen.*, 102, n. 172 (whence the description is taken).

[7] Flowers blue or violet.

[8] A genus allied to *Heliophila*.

[9] Spec. 1. *C. filiforme* Sond., *loc. cit.*; *Fl. Cap.*, i. 35.—*Heliophila filiformis* L. fil., *Suppl.*, 296.—DC., *Syst.*, ii. 679.—Walp., *Ann.*, vii. 180.

III. CAKILEÆ.

58. **Cakile** T.—Lateral sepals more or less gibbous. Stamens 6. Glands 4 ; 2 internal to smaller stamens ; 2 compressed-conoidal external to larger stamens. Siliqua long-subconical, drupaceous, finally suberous nucamentaceous, 2-jointed; lower joint unequally obpyramidal, compressed 2-edged, truncate at apex; upper concave conical or broadly ensiform, at base truncate-straight or decurrent, 2-alate; stigma sessile. Seeds solitary in each joint; integument thin; embryo fleshy; radicle long, cylindro-conoidal; cotyledons narrow, incumbent or more rarely oblique. Seed of upper joint ascending suberect; seed of lower descending.—Annual branching herbs, fleshy glabrous; leaves entire or pinnatifid; flowers racemose, ebracteate (*Europe, Coast of North America, Australia*) See p. 195.

59. **Enarthrocarpus** LABILL.[1]—Sepals equal, or lateral saccate at base. Siliqua oblong or much elongated, straight or curved, subcompressed, indehiscent; joints 2; lower shorter, 1- or more rarely 2-celled, 1–4-seeded; seeds descending; upper multilocellate, continuous or more or less contracted between seeds; pericarp subdrupaceous through induration of endocarp; seeds ascending; embryo fleshy; cotyledons elongated incumbent, more rarely conduplicate or complicate in lower joint.—Annual erect branching herbs; lower leaves lyrate; upper coarsely dentate; racemes[2] elongated; pedicels more or less thickened, sometimes short obconical erect (*Hussonia*[3]), sometimes all bracteate, or only the lower ones[4] (*The East, North Africa*[5]).

60. **Rapistrum** BOERH.[6]—Sepals lax, equal or unequal at base.

[1] *Fl. Syr., Dec.* v. 4, t. 2.—DC., *Prodr.*, i. 129.—ENDL., *Gen.*, n. 4970.—B. H., *Gen.*, 99, n. 157.

[2] Flowers yellow or purplish.

[3] BOISS., *Diagn. Or.*, viii. 46.

[4] "A genus scarcely distinguishable from *Eruca*, except by connate valves of lower joint." (B. H., *loc. cit.*)

[5] Spec. 4. DEL., *Fl. d'Egypte*, t. 36, fig. 1 (*Raphanus*).—DELESS., *Ic. Sel.*, ii. t. 93.—BOISS., *Fl. Or.*, i. 398.—WALP., *Ann.*, ii. 55 ; iv. 221.

[6] *Lugd.-Bat.*, 406.—DESVX., *Journ. Bot.*, iii. 150.—DC., *Prodr.*, i. 227.—ENDL., *Gen.*, n. 4968.—B. H., *Gen.*, 99, n. 155.

Petals rather long-unguiculate. Stamens 6, free, toothless, 4-dynamous. Disk of variable form; placentary glands compressed-3-gonous or arcuate-concave. Siliqua 2-jointed indehiscent; lower joint stipitate obpyramidal, aspermous or 1-seeded (*Didesmus*,[1] *Otocarpus*[2]), sometimes 2–4-seeded (*Cordylocarpus*[3]); seeds 1-seriate descending; upper joint ovoid or cylindrical, rostrate, costate or alate tuberculate, more rarely broadly obcuneate-2-horned (*Otocarpus*), usually 1-seeded; seed ascending; funicle short; embryo often coloured; cotyledons conduplicate or 2-plicate at apex.—Erect branching herbs, pubescent or pilose; flowers[4] in elongated simple or branched racemes; pedicels slender, when fruiting thickened, erect or patent (*South Europe*, *West Asia*, *North Africa*[5]).

61. **Muricaria** Desvx.[6]—Sepals equal at base suberect. Petals unguiculate. Stamens free, 4-dynamous. Siliqua short crustaceous, 2-jointed indehiscent; lower joint very short seedless; upper subglobose or ovoid, echinate, tuberculate or rostrate, 1-seeded; style conical or subcylindrical compressed;[7] stigmatose apex more or less capitate. Seed descending oblong compressed; embryo coloured; cotyledons conduplicate.—Branching herbs, erect or procumbent; leaves pinnatilobate; flowers[8] in racemes, at first contracted corymbiform, finally elongated (*North Africa*[9]).

62. **Crambe** T.[10]—Sepals equal at base, spreading. Petals 4, more or less long in the claw. Stamens 6, free; longer sometimes possessing a tooth. Germen subclavate, lower joint linear cylindrical; ovule rudimentary; upper joint ovoid; ovule descending; stigma sessile. Fruit 2-jointed subdrupaceous, finally dry indehiscent; lower joint stipe-like, aspermous; upper subglobose 1-seeded; seed

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1 Desvx., *Journ. Bot.*, iii. 160, t. 25, fig. 11.—DC., *Syst.*, ii. 657.—Endl., *Gen.*, n. 4969.

2 Dur., in *Rev. Bot.*, ii. 435; *Fl. Alg.*, t. 77.

3 Desf., *Fl. Atl.*, ii. 79, t. 152.—DC., *Syst.*, ii. 434.

4 Yellow; often rather large.

5 Spec. about 7. Deless., *Ic. Sel.*, ii. t. 92.—Eichl., in *Mart. Fl. Bras.*, *Crucif.*, 309.—Boiss., *Fl. Or.*, i. 403, 404.—Gren. & Godr., *Fl. de Fr.*, i. 155.—Walp., *Rep.*, ii. 763; iv. 219; *Ann.*, i. 50 (*Octocarpus*); vii. 177.

6 *Journ. Bot.*, iii. 159, t. 25, fig. 2.—DC., *Prodr.*, ii. 225.—Endl., *Gen.*, n. 4965.—B. H., *Gen.*, 99, n. 154.—*Kremeria* Coss., in *Bull. Soc. Bot. de Fr.*, iii. 671.

7 Rather long in *Kremeria*.

8 White or yellow.

9 Spec. 2. Desf., *Fl. Atl.*, ii. t. 150 (*Bunias*).

10 *Inst.*, 211, t. 100.—L., *Gen.*, n. 825.—Adans., *Fam. des Pl.*, ii. 224.—J., *Gen.*, 242.—Gærtn., *Fruct.*, ii. 292.—DC., *Prodr.*, 225.—Spach, *Suit. à Buffon*, vi. 326.—Endl., *Gen.*, n. 4967.—Payer, *Organog.*, 215, t. 44.—B. H., *Gen.*, 98, n. 153.

pendulous from slender funicle rising from bottom of cell. Embryo subglobose fleshy; cotyledons closely conduplicate.—Herbs or undershrubs; stock thick branching, like the rest of the plant glabrous glaucous or sprinkled with simple hairs; leaves alternate, often broad pinnatisect; flowers[1] in large much branched elongated racemes; pedicels filiform, thickened at apex; bracts 0, or more rarely minute; fruit erect-spreading (*Europe, Islands North-west of Africa, West Asia*[2]).

63. **Hemicrambe** WEBB.[3]—Sepals equal at base, spreading. Petals elongated. Stamens 6; filaments dilated. Siliqua 2-articulate; joints 1-celled, 2-valved; lower smaller sterile, or 1–2-seeded; upper ∞-seeded elongated linear complanate; margin acute; rostrum obtuse empty; style short, stigmatose at apex; valves 1-ribbed, transversely depressed between seeds, septum rudimentary. Seeds oblong or obovate compressed; those of lower joint, and lower ones of upper joint descending; uppermost transverse or obliquely ascending; cotyledons conduplicate.—A small glabrous shrub;[4] leaves alternate, long-petiolate, unequally lyrate; flowers[5] in much branched terminal racemes; pedicels lax filiform elongated ebracteate (*Tingitana*[6]).

64. **Physorhynchus** HOOK.[7]—Sepals erect equal at base. Stamens 6, free toothless. Siliqua erect, 2-jointed; lower joint rather short subobconical, longitudinally 2-celled, 2-valved; valves unequal dehiscent; cells aspermous; upper joint much larger, ovoid subconical rostrate, thick suberous nucamentaceous, 2-celled, tapering into style; apex capitellate; cells 2–4-seeded; septum thin. Seeds descending compressed; embryo rather fleshy; cotyledons conduplicate.—An erect glabrous glaucous undershrub, thick at base, branching, leafy; leaves alternate, rather fleshy; lower petiolate ovate; cauline con-

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1 White.

2 Spec. about 15. REICHB., *Ic. Fl. Germ.*, ii. t. 2.—DELESS., *Ic. Sel.*, ii. t. 91.—BOISS., *Fl. Or.*, i. 405.—GREN. & GODR., *Fl. de Fr.*, i. 156. —WALP., *Rep.*, ii. 762; *Ann.*, i. 49.

3 In *Ann. Sc. Nat.*, sér. 3, xvi. 246, t. 19.—B. H., *Gen.*, 99, n. 158.

4 With the aspect of *Brassica*, at the same time recalling several Papaverads, such as *Bocconia*, *Chelidonium*.

5 Yellow.

6 Spec. 1. *H. fruticulosa* WEBB, *loc. cit.*—WALP., *Ann.*, iv. 215.

7 *Icon.*, t. 821, 822.—B. H., *Gen.*, 100, n. 162.

tracted at base, auriculate; flowers[1] in elongated racemes; pedicels ebracteate rather short, finally thickened at apex (*Afghanistan*[2]).

65. **Fortuynia** SHUTT.[3]—Sepals erect equal at base. Petals linear. Stamens 6, 4-dynamous, free. Siliqua very compressed elliptical or obovate, 2-jointed; lower joint aspermous, longitudinally 2-celled, 2-valved; upper subglobose thick indehiscent 2-celled, 2-seeded; margin dilated into a broad wing; style short, stigmatose emarginate at apex. Seed descending from near apex of each cell; embryo fleshy; cotyledons conduplicate; radicle cylindrical accumbent.—Perennial erect virgate glabrous herbs; leaves alternate oblong entire glabrous glaucous fleshy; flowers[4] in simple or scarcely branched straight elongated terminal racemes (*Persia*[5])..

66. **Erucaria** GÆRTN.[6]—Sepals equal at base, erect. Petals long-unguiculate. Stamens 6, free. Siliqua 2-jointed; upper joint globose or elongated ensiform, sometimes ovoid (*Guiraoa*[7]) rostrate indehiscent, 1–4-locellate; cells superposed 1-seeded; seeds ascending; style elongated; stigmatose apex capitellate (*Guiraoa*) or emarginate; lower joint elongated cylindrical or compressed 2-valved; valves long-rectangular; septum membranous; seeds ∞ descending. Embryo fleshy; cotyledons of seeds of upper joint conduplicate; of lower incumbent conduplicate or convolute, sometimes undulate.—Annual erect branching glabrous herbs; leaves sinuate-dentate or pinnatifid; racemes ebracteate; flowers variable;[8] pedicels thickened at apex, erect when fruiting (*South Europe, North Africa, Syria, Persia, Greece*[9]).

67. **Morisia** J. GAY.[10]—Sepals erect; lateral subsaccate at base.

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1 Middle-sized, white.

2 Spec. 1. *P. brahmicus* HOOK., *loc. cit.*—BOISS., *Fl. Or.*, i. 402.—WALP., *Ann.*, iv. 215.

3 Ex BOISS., in *Ann. Sc. Nat.*, sér. 2, xvi. 379.—B. H., *Gen.*, 100, n. 161.

4 Small, white.

5 BOISS., *Fl. Or.*, i. 401.—WALP., *Rep.*, i. 183.

6 *Fruct.*, ii. 298, t. 143, fig. 9.—DC., *Prodr.*, i. 230.—ENDL., *Gen.*, n. 4974.—B. H., *Gen.*, 100, n. 159.—? *Reboudia* COSS., in *Bull. Soc. Bot. de Fr.*, iii. 705.

7 COSS., *Not. Pl. Mid. Esp.*, iii. 97.—B. H., *Gen.*, 100, n. 160.—WALP., *Ann.*, iii. 824.

8 White, yellow, reddish white, or purple, small or rather large; pedicels long or short.

9 Spec. 4. R. BR., in *Ait. Hort. Kew.*, ed. 2, iv. 122.—DELESS., *Ic. Sel.*, ii. t. 95.—DEL., *Fl. d'Egypte*, 30.—BOISS., *Fl. Or.*, i. 365.—WALP., *Rep.*, ii. 764; *Ann.*, i. 50; ii. 56; vii. 178.

10 In *Colla Hort. Ripul.*, App., iv. 50.—MORIS, *Fl. Sard.*, t. 7.—ENDL., *Gen.*, n. 4947.—B. H., *Gen.*, 100, n. 163.

Stamens 6; filaments free toothless. Siliqua (finally buried in the earth), 2-jointed; joints longitudinally 2-celled; lower oblong or turgid, 2-valved; valves hemispherical scarcely deciduous; seeds ∞, 2-seriate; upper joint subequal or usually smaller, subglobose or ovoid, indehiscent; cells 2, 1-seeded; style terete; stigmatose capitate rostrate. Seeds different in the 2 joints; in upper obliquely ascending or descending; cotyledons conduplicate; in lower descending or subtransverse; one cotyledon nearly flat, the other dorsally convex.—A low, very depressed, subacaulescent herb; root thick subligneous; leaves rosulate elongated pinnatilobate; flowers subradical solitary pedunculate; peduncles scapiform, when fruiting contorted-deflexed[1] (*Sardinia, Corsica*[2]).

IV. ISATIDEÆ.

68. **Isatis** T.—Sepals equal at base. Petals imbricate. Stamens 6, 4-dynamous free toothless. Siliqua linear-oblong, ovate orbiculate or oblong-cuneate, indehiscent, woody horny or osseous in centre; margin coriaceous thickened or foliaceous; style very short papillose-stigmatose; seed descending from top of cell, immarginate; embryo rather fleshy; cotyledons incumbent, very rarely accumbent.—Annual or 2-ennial herbs, erect branching, glabrous glaucous, pubescent, or more rarely tomentose; leaves entire; cauline sagittate; flowers in lax usually branching racemes; pedicels ebracteate slender, when fruiting, deflexed (*Europe, North and Central Asia, North of Africa*). See p. 197.

69. **Pachypterygium** BGE.[3]—Sepals equal at base, patulous. Petals contracted at base. Stamens 6, free toothless. Siliqua small elliptical, depressed in centre, coriaceous, thickened suberous at margin, indehiscent; style very short; apex stigmatose emarginate;

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[1] "A genus of doubtful relations; allied to *Chorispora*?" (B. H., *loc. cit.*), placed by many authors at foot of *Cakilineæ*.

[2] Spec. 1. *M. hypogæa* J. GAY, *loc. cit.*—MOR., *Fl. Sard.*, i. 104.—GREN. & GODR., *Fl. de Fr.*, i. 155.—*Erucaria hypogæa* VIV.—*Rapistum hypogæum* DUB., *Bot. Gall.*, 54.

[3] In *Linnæa*, xviii. 155.—B. H., *Gen.*, 94, n. 130.—*Pachypteris* KAR. & KIR., in *Bull. Mosc.* (1842), i. 159 (nec R. BR.).

seed descending, obovate-compressed, immarginate smooth; cotyledons incumbent; funicle adnate to wall.—Small thin branching herbs, quite glabrous; leaves linear or oblong, sessile; cauline cordate at base; flowers[1] (minute) racemose; pedicels ebracteate filiform, when fruiting recurved (*Caspian, Songaria*[2]).

70. **Dipterygium** DCNE.[3]—Sepals short, subequal at base. Petals shortly unguiculate. Stamens 6, free; filaments short. Siliqua elliptical-oblong, compressed subdrupaceous; exocarp dilated into a lax thin vertical membrane; endocarp nucamentaceous, unequally rugose outside, 1-seeded;[4] style subulate; apex capitate stigmatose. Seed ascending, immarginate; embryo coloured; cotyledons incumbent, concave.—A virgate undershrub, divaricately branching;[5] leaves small, alternate, petiolate, ovate or oblong, acute entire; flowers racemose; pedicels bracteolate, slender, short, erect, when fruiting pendulous (*Arabia, Nubia, West Indies*[6]).

71. **Tauscheria** FISCH.[7]—Sepals subequal at base. Stamens 6, free 4-dynamous; glands small, interposed. Siliqua shortly ovate-cymbiform, unsymmetrical, arcuate-ovate, crustaceous in centre, sometimes convex, sometimes with margin involute concave alate; apex tapering into a subulate style. Seed 1, descending from near apex of cell; cotyledons incumbent.—An annual branching herb, glabrous glaucous, or pilose; leaves entire; cauline amplexicaul; flowers[8] ebracteate in simple axillary and terminal racemes; pedicels decurved when fruiting (*Central Asia, North India*[9]).

72. **Moriera** BOISS.[10]—Sepals equal at base. Stamens free, nearly

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[1] Yellow.

[2] Spec. 2. BGE., *Enum. Pl. Lehman.*, t. 7.—BOISS., *Fl. Or.*, i. 373.—WALP., *Rep.*, ii. 762; v. 48.

[3] In *Ann. Sc. Nat.*, sér. 2, iv. 67, t. 3.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 179.—B. H., *Gen.*, 95, n. 132.—*Pteroloma* HOCHST. & STEUD., in *Schimp. Pl. Arab. Exs.*, n. 851.

[4] Ovules 1, 2.

[5] With aspect of many *Resedaceæ*.

[6] Spec. 1. *D. glaucum* DCNE., *loc. cit.*—BOISS., *Fl. Or.*, i. 417 (*Capparidacea*).—WALP., *Rep.*, i. 180.—*D. glabrum* DCNE., *loc. cit.*—*Pteroloma arabicum* STEUD. & HOCHST., *loc. cit.*

[7] In DC., *Syst. Veg.*, ii. 563; *Prodr.*, i. 210.—ENDL., *Gen.*, n. 4939.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 178.—B. H., *Gen.*, 94, n. 131.

[8] Yellow; small.

[9] Spec. 1. *T. lasiocarpa* FISCH., *loc. cit.*—ROYLE, *Ill. Himal.*, t. 17.—BOISS., *Fl. Or.*, i. 371.

[10] In *Ann. Sc. Nat.*, sér. 2, xvi. 380.—B. H.,

flat or winged at base. Siliqua patent, orbicular obcordate or oblong, indehiscent or subdehiscent, crustaceous in middle, broadly membranous at margin ; style very short ; apex stigmatose, emarginate ; lobes sometimes immersed in upper sinus of ovary. Seed 1,[1] descending; cotyledons incumbent or obliquely accumbent; radicle ascending.—Herbs suffruticose at base, or much branching undershrubs, sometimes aphyllous spinescent ; leaves alternate or opposite, obovate or linear-oblong, sometimes 0 ; flowers[2] in short subcorymbose racemes, finally elongated ; rachis sometimes spinescent ; pedicels slender, ebracteate (*The East*[3]).

73. **Clypeola** L.[4]—Sepals equal at base, erect or spreading. Petals shortly unguiculate. Stamens 6, 4-dynamous ; filaments membranous, appendiculate. Siliqua orbicular flat, broadly marginate, entire, or unequally incised or toothed, sometimes lanate, 1-celled ; style short ; apex stigmatiferous, emarginate. Seed 1, subcentral orbicular immarginate, descending from funicle ; embryo much compressed ; cotyledons accumbent.—Herbs usually annual, thin, hoary with stellate down ; leaves linear entire ; flowers[5] in often short racemes ; pedicels ebracteate, recurved when fruiting (*Central and South Europe, Mediterranean regions of Asia and Africa*[6]).

74. **Thysanocarpus** Hook.[7]—Sepals equal at base, nearly equal to petals. Siliqua orbicular, ovate or obovate, much compressed indehiscent, coriaceous in middle, 1-celled, at margin membranous winged, and entire sinuate or lobed ; lobes contracted at base, more or less coalescent at apex, leaving spurious perforations. Seed 1, descending, immarginate ; cotyledons accumbent or obliquely incumbent.—Annual slender herbs ; radical leaves pinnatifid ; cauline

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Gen., 94, n. 128.—*Lipophragma* Schott & Kotsch., *Analect. Bot.*, fasc. iii. (ex B. H., *loc. cit.*).—*Crenularia* Boiss., in *Ann. Sc. Nat.*, sér. 2, xvii. 181.

[1] Ovules 1–3.

[2] White, small or minute.

[3] Boiss., *Fl. Or.*, i. 338.—Walp., *Rep.*, i. 180 ; *Ann.*, i. 45 ; ii. 46 ; vii. 173.

[4] *Gen.*, n. 807.—J., *Gen.*, 240.—DC., *Prodr.*, i. 165.—Endl., *Gen.*, n. 4877.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 178.—B. H., *Gen.*, 93, 967, n. 126.—*Bergeretia* Desvx., in *Journ. Bot.*, iii. 161.—*Orium* Desvx., *loc. cit.*, 162.

[5] Small, white or yellow.

[6] Spec. about 8. Reichb., *Ic. Fl. Germ.*, ii. t. 12.—Boiss., *Fl. Or.*, i. 308.—Gren. & Godr., *Fl. de Fr.*, i. 120.—Walp., *Rep.*, i. 146 ; *Ann.*, i. 34 ; vii. 172.

[7] *Fl. Bor.-Amer.*, i. 69, t. 18 A ; *Ic.*, t. 39, 42.—Endl., *Gen.*, n. 4940.—B. H., *Gen.*, 94, n. 127.

subentire, sagittate at base; flowers[1] in thin racemes; pedicels filiform ebracteate, when fruiting nutant (*California, Oregon*[2]).

75. **Peltaria** L.[3]—Sepals equal at base, spreading. Petals unguiculate. Stamens 6, 4-dynamous, toothless. Siliqua suborbicular or obovate, very compressed, reticulate-ribbed, 1-celled, indehiscent; style short; apex stigmatose, emarginate. Seeds 1–4, descending compressed immarginate; funicles slender, more or less adnate to valves; embryo compressed; cotyledons accumbent.—Glabrous herbs; leaves entire; cauline sagittate-cordate at base; flowers[4] in short racemes, usually ramose or corymbiform; pedicels slender ebracteate, when fruiting patent or recurved[5] (*Southern and Eastern Europe*[6]).

76. **Tchihatchewia** Boiss.[7]—"Sepals erect; lateral saccate at base. Petals unguiculate; lamina minute. Stamens without teeth; siliqua pendulous obovate compressed, broadly membranous-marginate, 1-celled, 2-seeded; cell linear-elliptical; stigma sessile punctiform. Seeds pendulous from free short thickened funicles, ovate compressed immarginate; cotyledons plane accumbent.—A biennial herb (?) very hispid;[8] root thick; stem thick, leafy, bristling with long white hairs; leaves oblong-linear dentate; racemes short, with bracts at base"[9] (*Armenia*[10]).

77. **Tetrapterygium** Fisch. & Mey.[11]—Sepals patulous, subequal at base. Stamens free, 4-dynamous. Siliqua oblong or obovate, orbiculate, rounded or cordate at base, 4-winged; wings unequal (2 shorter) membranous; cell 1, indehiscent, 1-seeded; style slender;

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[1] White, pink, or violet.

[2] Spec. about 8. Fisch. & Mey., *Ind. Sem. Hort. Petrop.*, ii. 50.—Walp., *Rep.*, i. 183; *Ann.*, ii. 52.

[3] *Gen.*, n. 806.—DC., *Prodr.*, i. 166.—Endl., *Gen.*, n. 4878.—B. H., *Gen.*, 93, n. 124.

[4] White.

[5] A genus in many characters allied to *Lunaria*." (B. H., *loc. cit.*)

[6] Spec. 3. Reichb., *Ic. Fl. Germ.*, ii. t. 12.—Boiss., *Fl. Or.*, i. 307.—Gren. & Godr., *Fl. de Fr.*, i. 121.—Walp., *Rep.*, i. 146.

[7] In *Tchihatch. As. Min., Bot.*, i. 292 (whence our description).—B. H., *Gen.*, 93, n. 125.

[8] "Habit of *Farsetia*; fruit of *Isatis*, 9 lines long, with a furcate down, becoming puberulous seeds large."

[9] "Flowers of size of *Raphanus Raphanistrum*; purple."

[10] Spec. 1. *T. isatidea* Boiss., *loc. cit.*; *Fl Or.*, i. 310.—Walp., *Ann.*, vii. 172.

[11] *Ind. Sem. Hort. Petrop.* (1835), 39.—Endl. *Gen.*, n. 4937.—B. H., *Gen.*, 95, n. 133.

apex globose, not marginate, stigmatose. Seed descending; cotyledons of fleshy embryo concave or conduplicate; radicle cylindrical incumbent, immersed in a layer of albumen.—An annual herb, branching glaucous; leaves alternate entire; inferior petiolate; superior amplexicaul; flowers[1] in ebracteate racemes; fructiferous pedicels decurved (*Persia*[2]).

78. **Boreava** JAUB. & SPACH.[3]—Sepals subequal patulous. Petals long-unguiculate. Stamens 6, 4-dynamous. Glands rather prominent between larger stamens; subconical subcircinate around smaller. Siliqua ovoid-4-gonous, 4-winged, crustaceous, at apex tapering to pyramidate style; stigma capitate simple; ovule 1, descending; raphe dorsal. Seed alone in loculus, descending, glabrous, immarginate; radicle superior accumbent: cotyledons concave or inflexed.—A glabrous erect branching herb; leaves sessile cordate-amplexicaul entire; flowers[4] arranged in ramose patulous racemes, ebracteate (*Asia Minor*[5]).

79. **Calepina** ADANS.[6]—Sepals equal at base, patulous. Petals unguiculate; exterior usually somewhat shorter. Stamens 6, free, 4-dynamous. Siliqua small, thick ovoid or oblong, subcompressed, subdrupaceous; endocarp crustaceous lacunose, indehiscent, 1-seeded; style short compressed; apex stigmatose subcapitate. Seed descending glabrous; embryo fleshy; cotyledons conduplicate.—An annual herb, erect branching glabrous; radical leaves pinnatifid; cauline sagittate at base; flowers[7] racemose; pedicels ebracteate slender, when fruiting erect-patent (*Southern Europe, Asia Minor, and Northern Asia*[8]).

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1 Yellow, small.

2 Spec. 1. *T. glastifolium* FISCH. & MEY., *loc. cit.*—*T. stylophorum* JAUB. & SPACH, *Ill. Pl. Or.*, t. 50.—BOISS., *Fl. Or.*, i. 375 (*Sameraria*).—WALP., *Rep.*, v. 43.

3 *Ill. Pl. Or.*, i. 3, t. 2.—B. H., *Gen.*, 95, n. 134.—*Martinsia* GODR., *Fl. Juven.*, ed. 2, 58.

4 Middle size, yellow (almost of *Diplotaxis*).

5 Spec. 1. *B. orientalis* JAUB. & SPACH, *loc. cit.*—BOISS., *Fl. Or.*, i. 372.—WALP., *Rep.*, i. 180; *Ann.*, ii. 53.

6 *Fam. des Pl.*, ii. 423.—DC., *Syst. Veg.*, ii. 648; *Prodr.*, i. 255.—ENDL., *Gen.*, n. 4966.—B. H., *Gen.*, 96, n. 140.

7 Small, white.

8 Spec. 1. *C. Corvini* DESVX., *Journ. Bot.*, iii. 158.—GREN. & GODR., *Fl. de Fr.*, i. 132.—REICHB., *Ic. Fl. Germ.*, ii. t. 2.—BOISS., *Fl. Or.*, i. 409.—*Bunias cochlearioides* DC.—*Myagrum erucæfolium* VILL. — *M. bursifolium* THUILL.—*Crambe Corvini* ALL., *Fl. Pedem.*, i. 256.

80. **Texiera** JAUB. & SPACH.[1]—Sepals subequal at base. Stamens free, 4-dynamous. Siliqua subglobose or broadly obtuse, indehiscent, subdrupaceous; endocarp bony; mesocarp porous; epicarp glabrous; stigma peltate subsessile. Seed 1, descending immarginate; embryo fleshy; cotyledons concave or folded; radicle incumbent.—Herb branching slender glabrous glaucous; leaves alternate sagittate amplexicaul entire; flowers[2] arranged into branching terminal and leaf-opposed ebracteate racemes; pedicels short, when fruiting deflexed (*Syria*[3]).

81. **Schimpera** HOCHST. & STEUD.[4]—Sepals short, equal at base, patulous. Petals small, usually shorter than calyx. Stamens 6, free, subequal. Siliqua oblique subovoid compressed rugose; apex produced to a large sword-shaped compressed beak, minutely-emarginate-capitate at apex;[5] cell 1, 1-seeded (or with another abortive seed). Seed descending; micropyle superior introrse; funicle short; cotyledons of fleshy embryo subconduplicate.—Annual herbs, branching, glabrous or pilose; leaves alternate, sinuate or runcinate-pinnatifid; flowers[6] in ebracteate racemes[7] (*Arabia*, *Persia*[8]).

82. **Myagrum** T.[9]—Sepals equal at base, suberect. Petals a little longer than calyx. Stamens 6; larger free or subconnate at base. Glands 4; placentary pair simple; carpellary 2-lobed. Siliqua obpyramidate sublyrate, long-cuneate at base, compressed suberous; apex spuriously 3-celled; lateral cells empty, middle fertile; style shortly conical; apex stigmatose, minutely capitate emarginate, persistent at top of fruit. Seed subpendulous, descending from side

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[1] *Ill. Fl. Or.*, i. t. 1.—B. H., *Gen.*, 96, n. 139.—*Glastaria* BOISS., in *Ann. Sc. Nat.*, sér. 2, xvii. 203.

[2] Small, yellow.

[3] Spec. 1. *T. glastifolia* JAUB. & SPACH, *loc. cit.*—*Glastaria deflexa* BOISS., *Fl. Or.*, i. 373.—WALP., *Rep.*, i. 146.—*Peltaria deflexa* DC., *Syst.*, ii. 337.

[4] Ex ENDL., *Gen.*, n. 4982.—B. H., *Gen.*, 96, n. 141.—*Trallia* LINDL. (ex ENDL., *Suppl.*, 1419).

[5] "Ornithocephaloid."

[6] Yellow, small.

[7] "A genus allied to *Euclidium*." (B. H., *loc. cit.*).

[8] Spec. 2. WEBB, in *Journ. Bot. Ital.* (1852), 221.—BOISS., *Fl. Or.*, i. 384.—WALP., *Rep.*, i. 192; *Ann.*, i. 58; ii. 57.

[9] *Inst.*, 211, t. 99.—MEDIK., *Gen.*, i. 39, t. 1, fig. 1.—R. BR., in *Ait. Hort. Kew.*, ed. 2, iv. 74.—DESVX., in *Journ. Bot.*, iii. 160, t. 25, fig. 5.—DC., *Syst.*, ii. 573; *Prodr.*, i. 212.—SPACH, *Suit. à Buffon*, vi. 583.—ENDL., *Gen.*, n. 4943.—B. H., *Gen.*, 96, n. 142.—*Bricourtia* ADANS., *Fam. des Pl.*, ii. 423.—*Deltocarpus* LHÉR., mss. —*Sinistrophorum* SCHRANK, mss. (ex ENDL.).

of central cell, obovate or oblong, immarginate; cotyledons of thick embryo incumbent, concave or subconduplicate.—An annual herb, glabrous glaucous, erect ramose; leaves alternate entire; inferior petiolate; superior auriculate-2-lobed; flowers[1] in straight elongated racemes; pedicels ebracteate short erect; when fruiting thickened obconical hollow (*Southern Europe, the East*[2]).

83. **Sobolewskia** BIEB.[3]—Sepals equal at base, patulous. Stamens 6, 4-dynamous; lateral very short; longer broader at base. Siliqua ascending subclavate, slightly compressed or terete, suberect or curved, subcoriaceous ribbed, 1-celled; apex tumid hollow; stigma globose sessile. Seed 1 (abortive ovules 1–2) descending from near apex of cell by short funicle, elongated, cylindrical or subfusiform; cotyledons of fleshy embryo elongated incumbent.—Herbs, erect branching glabrous; leaves long-petiolate subrotundate crenate; flowers[4] in ebracteate racemes; pedicels slender; when fruiting thickened decurved (*Asia Minor*[5]).

84. **Spirorhynchus** KAR. & KIR.[6]—Sepals erect, equal at base. Petals long linear, slightly contracted at base. Stamens 6, 4-dynamous; lateral 2 shorter sterile; longer fertile, connate in pairs; placentary glands elongated. Siliqua elongated, subterete, tapering at both ends, 2-ribbed, at apex prolonged to a very long style, curved slender narrowly 2-winged or marginate, 1-celled, indehiscent. Seed descending oblong immarginate; embryo coloured;[7] cotyledons narrow incumbent; radicle conical, thickened at middle.—Herbs, annual branching glabrous; leaves linear, sinuate-dentate or pinnatifid; flowers few in elongated racemes; pedicels filiform; when fructiferous patulous or deflexed[8] (*Persia, Songaria*[9]).

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1 Yellow, small.

2 Spec. 1. *M. perfoliatum* L., *Spec.*, 893.—REICHB., *Ic. Fl. Germ.*, ii. t. 4.—GREN. & GODR., *Fl. de Fr.*, ii. 129.—BOISS., *Fl. Or.*, i. 370.—*Cakile perfoliata* LHÉR., in *DC. Fl. Fr.*, iv. 720.

3 *Fl. Taur.-Cauc.*, Suppl., 421.—DC., *Prodr.*, i. 212.—ENDL., *Gen.*, n. 4941.—B. H., *Gen.*, 95, n. 136.

4 Small, white.

5 Spec. 4. W., *Spec.*, iii. 450 (*Cochlearia*).—DELESS., *Ic. Sel.*, ii. t. 80.—TCHIHATCH., *As. Min.*, *Bot.*, i. 346.—BOISS., *Fl. Or.*, i. 244.—WALP., *Ann.*, ii. 52.

6 In *Bull. Mosc.* (1842), i. 160.—B. H., *Gen.*, 95, n. 137.

7 Yellowish.

8 "A genus approaching the *Raphaneæ*." (B. H., *loc. cit.*)

9 BOISS., *Fl. Or.*, i. 385.—WALP., *Rep.*, ii. 762.

85. **Neslia** DESVX.[1]—Sepals subequal at base, patulous. Siliqua shortly stipitate globose subcompressed subcrustaceous reticulated, indehiscent or very slightly dehiscent, 1-celled by obliteration of septum with 1 or more, rarely few seeds; style slender; apex stigmatose emarginate. Seeds obliquely descending or subhorizontal, immarginate; cotyledons incumbent.—An annual herb, erect branching, covered with hairs or 2–3-fid bristles; leaves entire or subentire; cauline sagittate; flowers[2] in often branching racemes with slender ebracteate pedicels; fruiting pedicels erect-patent (*Europe, Western Asia*[3]).

86 ? **Palmstruckia** SOND.[4]—"Flowers...? Siliqua sessile large orbicular, plano-compressed, 1-celled, 1-seeded, indehiscent; valves nearly flat not ribbed venose; style very short. Seed orbicular compressed, broadly winged emarginate; cotyledons linear incumbent transversely 2-plicate.—An erect herb, decumbent at base, branching; branches terete; leaves remote filiform; flowers turned downwards; pedicels filiform, ebracteate; racemes elongated when fruiting" (*Cape of Good Hope*[5]).

87. **Euclidium** R. BR.[6]—Sepals equal at base, patulous. Petals attenuated at base. Stamens free, without teeth. Siliqua obliquely ovate-globose dehiscent or indehiscent, 2-celled; septum thick; style in fruit obliquely subulate rostrate, in flower stigmatose emarginate at apex. Seeds solitary in either cell, generally descending from apex, broadly oblong-compressed; embryo fleshy; cotyledons accumbent or obliquely incumbent; radicle cylindrical ascending.—Herbs, annual straight branching rigid pubescent; leaves petiolate, entire runcinate or pinnatifid; flowers[7] in subspicate, lateral and terminal

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[1] *Journ. Bot.*, iii. 162.—DC., *Prodr.*, i. 202.—SPACH, *Suit. à Buffon*, vi. 580.—ENDL., *Gen.*, n. 4942.—B. H., *Gen.*, 95, n. 135.

[2] Small, yellow.

[3] Spec. 1. *N. paniculata* DESVX.—REICHB., *Ic. Fl. Germ.*, ii. t. 24.—BOISS., *Fl. Or.*, i. 371.—GREN. & GODR., *Fl. de Fr*, i. 131.—*Myagrum paniculatum* L. — *Alyssum paniculatum* W.—*Rapistrum sagittatum* GÆRTN.—*Cochlearia sagittata* CRANTZ.—*Vogelia sagittata* MEDIK.—*Chamælinum paniculatum* HOST.—*Crambe paniculata* ALL.—*Bunias paniculata* LHÉR.

[4] *Fl. Cap.*, i. 35 (whence our description).—B. H., *Gen.*, 96, n. 138.

[5] Spec. 1. *P. capensis* SOND., *loc. cit.*—WALP., *Ann.*, vii. 176.—*Peltaria capensis* THUNB., *Fl. Cap.*, 490 (nec L. FIL.).

[6] In *Ait. Hort. Kew.*, ed. 2, iv. 74.—DC., *Prodr.*, i. 184.—ENDL., *Gen.*, n. 4896.—B. H., *Gen.*, 97, n. 145.

[7] White, very small.

ebracteate racemes, afterwards elongated (*Central Europe, Western Asia*[1]).

88.* **Ochthodium** DC.[2]—Sepals subequal at base. Stamens free without teeth. Siliqua short, subquadrate-rotundate or broadly rhomboid; angles tuberculate-rugose; style short, apex stigmatose emarginate; septum thick; cells 2, 1-seeded. Seeds descending oblong compressed; radicle obliquely ascending; cotyledons incumbent or obliquely accumbent.—An annual herb, erect branching rigid, glabrous or pilose at base; leaves pinnatisect or lyrate-pinnatifid; flowers[3] in elongated racemes; pedicels slender; when fruiting erect thickened-subclavate (*The East*[4]).

89. **Zilla** Forsk.[5]—Sepals equal at base, erect. Petals obtuse, rather broadly unguiculate. Stamens 6, free; filaments without teeth; anthers sometimes subsagittate. Siliqua subpyramidate or ovate; epicarp produced to 2–4 (or 0) longitudinal wings;[6] endocarp long or crustaceous, 2-celled; style subulate, apex stigmatose subglobose. Seeds descending solitary in each cell; funicle short; embryo sometimes coloured;[7] radicle arcuate; cotyledons conduplicate, sometimes longitudinally undulate or subplicate.—Herbs or undershrubs, very branching leafy glaucescent; twigs often divaricated and thorny spinescent; leaves oblong dentate rather thick; flowers[8] loosely racemose, ebracteate or solitary (*Persia, Arabia, North Africa*[9]).

90. **Cycloptychis** E. Mey.[10]—Sepals erect, rather thick, longitudinally 3-ribbed, at base slightly unequal; 2 lateral slightly gibbous. Petals narrow-elongate subsessile. Stamens free; anthers sometimes subsagittate. Siliqua nucamentaceous orbicular-ovate strongly

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[1] Spec. 2. Gærtn., *Fruct.*, ii. t. 141, fig. 11 (*Bunias*).—Reichb., *Ic. Fl. Germ.*, ii. t. 1.—Boiss., *Fl. Or.*, i. 368.

[2] *Syst. Veg.*, ii. 423; *Prodr.*, i. 184.—Endl., *Gen.*, n. 4897.—B. H., *Gen.*, 97, n. 146.

[3] Yellow, very small.

[4] Jacq., *Hort. Vindob.*, t. 145 (*Bunias*).—Boiss., *Fl. Or.*, i. 369.

[5] *Fl. Ægypt.-Arab.*, 121; *Icon.*, t. 17 A.—DC., *Prodr.*, i. 224.—Endl., *Gen.*, n. 4964.—B. H., *Gen.*, 98, n. 152.

[6] "*Z. Chamærapistrum* Boiss. shows two very small valves at base of siliqua, and so allied to genuine *Cakilineæ*." (B. H., *loc. cit.*)

[7] Green.

[8] Rather large, white or violet.

[9] Spec. 4. Vent., *Jard. Malm.*, t. 16 (*Bunias*).—Boiss., *Fl. Or.*, i. 408.—Walp., *Rep.*, i. 188; ii. 763; *Ann.*, vii. 176.

[10] In *Herb. Drège*.—Harv. & Sond., *Fl. Cap.*, i. 34.—B. H., *Gen.*, 98, n. 151.

compressed, conical-beaked; valves marked with submuricate ribs radiating from lacunar disk; septum rather thick; style persistent elongate, apex stigmatose minutely capitate emarginate. Seeds solitary in each cell, subpendulous from short funicle, orbicular much compressed; cotyledons of embryo incumbent, transversely 2-plicate.—Herbs or undershrubs, erect virgate glabrous; leaves linear entire sessile; flowers[1] in elongated or subspicate racemes; pedicels ebracteate thickened at apex (*South Africa*[2]).

91 ? **Boleum** DESVX.[3]—"Sepals erect, equal at base. Longer stamens connate in pairs. Siliqua erect ovate-globose, indehiscent, 2-celled, 2-seeded, very hispid; style narrowly tongue-shaped beaked; septum membranous; stigma 2-lobed.—Seeds pendulous near apex of cell, broadly oblong compressed; testa membranous; funicle very short; cotyledons closely conduplicate; radicle curved.—An undershrub, very branching woody very hispid leafy; leaves linear, quite entire or lower ones divided; flowers[4] shortly racemose; pedicels ebracteate or inferior bracteate"[5] (*Spain*[6]).

92 ? **Lachnoloma** BGE.[7]—"Sepals erect, lateral saccate at base. Petals narrow. Stamens free toothless. Glands annular. Siliqua[8] ovoid-pyramidal, sub-4-gonous, long-villous, crustaceous, 2-celled, 2-seeded; septum thick; style subulate; stigma shortly 2-fid. Seeds obovate pendulous; testa very thin; funicle very short; cotyledons narrow incumbent; radicle large clavate.—An annual herb, pubescent-tomentose with stellate hairs, sparingly branching; leaves linear-lanceolate, sinuate-dentate or pinnatifid; flowers racemose,[9] ebracteate"[10] (*Caspian*[11]).

93. **Bunias** R. BR.[12]—Sepals subequal at base, patent (*Lælia*[13]), or

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1 Rather large, purple.

2 Spec. 2. HARV., *Thes. Cap.*, i. t. 59.

3 *Journ. Bot.*, iii. 163, t. 26.—DC., *Prodr.*, i. 223.—ENDL., *Gen.*, n. 4958.—B. H., *Gen.*, 98, n. 149 (whence our description).

4 "Middle sized, yellow."

5 "A genus probably very nearly allied to *Succovia* and *Vella*."

6 Spec. 1. *B. asperum* DESVX., *loc. cit.*—*Vella aspera* PERS., *Syn.*, ii. 185.

7 In *Linnæa*, xviii. 154; *Enum. Pl. Lehm.*, 41, t. 8.—B. H., *Gen.*, 98, n. 150 (whence our description).

8 "Erect, long and densely villous."

9 "Rather large; yellow (?)."

10 "A genus hardly distinguishable from *Boleus*."

11 Spec. 1. *L. Lehmanni* BGE., *loc. cit.*—BOISS., *Fl. Or.*, i. 369.—WALP., *Rep.*, v. 49.

12 In *Ait. Hort. Kew.*, ed. 2, iv. 75.—DC., *Prodr.*, i. 229.—ENDL., *Gen.*, n. 4973.—B. H., *Gen.*, 97, n. 147.—*Erucago* T., *Inst.*, 232, t. 103 (nec alior.).

13 DESVX., *Journ. Bot.*, iii. 160.—SPACH, *loc. cit.*, 585. Fruit 2-celled.

erect (*Erucago*[1]). Petals stamens and disk nearly of *Brassica.* Siliqua (drupaceous at first) finally nucamentaceous, unequally-ovoid or quadrate, beaked, with or without wings; cells 1–4, arranged in various ways; style frequently elongated; apex stigmatose, capitate or emarginate. Seeds descending, oblong-compressed or cochleate; funicle short; cotyledons of fleshy embryo linear, circinately convolute; radicle conical.—Annual or perennial herbs, glabrous or hairy (hairs furcate or glandulous); leaves alternate, entire runcinate or pinnatifid; flowers[2] racemose, pedicels ebracteate (*Europe, Western Asia*[3]).

94? **Pyramidium** Boiss.[4]—Sepals unequal at base; lateral shortly saccate. Petals linear twisted. Germen stipitate. Siliqua pyramidate, 4-angular beaked thick, suberous lacunose within, horned on both sides at base; cells 2 or 4, 1-seeded; septa thick; stigmas erect. Seeds descending, shortly funiculate; cotyledons of curved embryo accumbent.—An annual herb; leaves stellate-tomentose oblong; flowers remote alternate subsessile, ebracteate[5] (*Afghanistan*[6]).

95. **Octoceras** Bge.[7]—Sepals equal at base, patulous. Petals very small. Siliqua unequally cubic pyramidate or obpyramidate, nucamentaceous; of the cells 2 angular, 2 longitudinally subalate; septum rather thick; style conical, apex stigmatose capitate emarginate. Seeds solitary in each cell, pendulous under apex, oblong or obovate; funicle short; integuments thin; radicle of fleshy embryo cylindrical or fusiform, incumbent.—A small annual herb, branching from base, covered with stellate down; leaves sinuate or pinnatifid; flowers[8] racemose, ebracteate; spikes elongated when fruiting (*Afghanistan, Caspian*[9]).

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1 DC., *Syst.*, ii. 670.—Desvx., *loc. cit.*, 168. Fruit 4-celled; angles cristate.

2 Rather large; yellow, brassicoid.

3 Spec. 3, 4. Reichb., *Ic. Fl. Germ.*, ii. t. 1.—Gren. & Godr., *Fl. de Fr.*, i. 132.—Boiss., *Fl. Or.*, i. 409.—Walp., *Ann.*, ii. 56.

4 *Diagn. Or.*, sér. 2, i. 47.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 179.—B. H., *Gen.*, 97, n. 148.

5 A genus of doubtful affinities, referred by authors to *Isatis*. Flowers usually of *Matthiola* and *Morettia*. Hence it is certainly near *Lonchophora* (of which it is, perhaps, a section), having its fruit in all external characters; but the number of seeds is indefinite.

6 Spec. 1. *P. Griffithianum* Boiss., *loc. cit.*; *Fl. Or.*, i. 367.—Walp., *Ann.*, vii. 176.

7 *Enum. Pl. Lehm.*, 42, t. 4.—B. H., *Gen.*, 97, n. 144.

8 Very small, white.

9 Spec. 1. *O. Lehmannianum* Bge., *loc. cit.*—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 179.—Boiss., *Fl. Or.*, i. 370.—Walp., *Ann.*, i. 47.

orbicular ellipsoidal oblong or linear-angustate, turgid or more or less compressed; style erect, short or long; apex stigmatose, subcapitate or 2-lobed; lobes erect, connate or free; valves flat or convex, ribbed or not ribbed; septum veined, sometimes fenestrate. Seeds ∞, 1- or 2-seriate, sometimes solitary (*Ricotia*[1]), flat or immarginate; funicles slender free.—Herbs or undershrubs, branching virgate, hoary or silvery with bipartite or more rarely stellate appressed hairs, more rarely subglabrous (*Ricotia*); leaves alternate entire or pinnatisect (*Ricotia*); flowers[2] ebracteate in racemes sometimes spiciform (*Mediterranean, Tropical Africa, the East*[3]).

99. **Selenia** NUTT.[4]—Sepals subequal, patulous (coloured). Petals erect, finally much elongated. Stamens 6, free. Hypogynous glands 10. Siliqua oval subelliptical much compressed or turgid, acute at base or at both ends; style thin sword-shaped; apex stigmatose capitate; valves reticulate; septum hyaline, entire or more or less fenestrate. Seeds few in each cell (4–6), orbicular, much compressed, marginate or alate; funicles slender free.—Small annual herbs; leaves pinnatisect; flowers[5] in terminal leafy racemes (*Texas, Arkansas*[6]).

100. **Platyspermum** HOOK.[7]—Sepals equal, patulous obovate subsessile, afterwards much elongated, long-angustate, at base subspathulate. Stamens free. Siliqua ovate very much compressed sessile; valves flat glabrous; septum thin hyaline entire; style nearly absent; ovary stigmatose at top. Seeds few orbiculate compressed broadly marginate; funicles thin; cotyledons accumbent.—A low annual herb; leaves "radical," subentire or pinnatifid; flowers[8] solitary; peduncles long erect slender (*Oregon*[9]).

101. **Alyssum** L.[10]—Sepals equal at base, often rather short, erect

[1] L., *Gen.*, n. 810.—DC., *Prodr.*, i. 157.—ENDL., *Gen.*, n. 4864.—B. H., *Gen.*, 72, n. 26.

[2] White, yellow, purplish, or pale lilac (*Ricotia*).

[3] Spec. about 20. DELESS., *Ic. Sel.*, ii. t. 34.—BOISS., *Fl. Or.*, i. 157, 254 (*Ricotia*).—GREN. & GODR., *Fl. de Fr.*, i. 113.—*Bot. Reg.*, t. 49 (*Ricotia*).—WALP., *Rep.*, i. 139; ii. 36 (*Ricotia*), 757; *Ann.*, i. 31; ii. 36, 37; iv. 195; vii. 109.

[4] In *Journ. Acad. Philad.*, v. 132, t. 6.—A. GRAY, *Gen. Ill.*, t. 67.—B. H., *Gen.*, 72, n. 25.

[5] Yellow.

[6] Spec. 2. WALP., *Rep.*, i. 154; *Ann.*, vii. 108.

[7] *Fl. Bor.-Amer.*, i. 68, t. 18 B.—ENDL., *Gen.*, n. 4926.—B. H., *Gen.*, 72, n. 28 (nec HOFFM.).

[8] White, nearly of *Cardamine*.

[9] Spec. 1. *P. scapigerum* HOOK., *loc. cit.*

[10] *Gen.*, n. 805.—J., *Gen.*, 240.—DC., *Prodr.*, i. 160.—SPACH, *Suit. à Buffon*, vi. 476.—ENDL., *Gen.*, 4874.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 148.—B. H., *Gen.*, 73, 966, n. 34.

orbicular ellipsoidal oblong or linear-angustate, turgid or more or less compressed; style erect, short or long; apex stigmatose, subcapitate or 2-lobed; lobes erect, connate or free; valves flat or convex, ribbed or not ribbed; septum veined, sometimes fenestrate. Seeds ∞, 1- or 2-seriate, sometimes solitary (*Ricotia*[1]), flat or immarginate; funicles slender free.—Herbs or undershrubs, branching virgate, hoary or silvery with bipartite or more rarely stellate appressed hairs, more rarely subglabrous (*Ricotia*); leaves alternate entire or pinnatisect (*Ricotia*); flowers[2] ebracteate in racemes sometimes spiciform (*Mediterranean, Tropical Africa, the East*[3]).

99. **Selenia** NUTT.[4]—Sepals subequal, patulous (coloured). Petals erect, finally much elongated. Stamens 6, free. Hypogynous glands 10. Siliqua oval subelliptical much compressed or turgid, acute at base or at both ends; style thin sword-shaped; apex stigmatose capitate; valves reticulate; septum hyaline, entire or more or less fenestrate. Seeds few in each cell (4–6), orbicular, much compressed, marginate or alate; funicles slender free.—Small annual herbs; leaves pinnatisect; flowers[5] in terminal leafy racemes (*Texas, Arkansas*[6]).

100. **Platyspermum** HOOK.[7]—Sepals equal, patulous obovate subsessile, afterwards much elongated, long-angustate, at base subspathulate. Stamens free. Siliqua ovate very much compressed sessile; valves flat glabrous; septum thin hyaline entire; style nearly absent; ovary stigmatose at top. Seeds few orbiculate compressed broadly marginate; funicles thin; cotyledons accumbent.—A low annual herb; leaves "radical," subentire or pinnatifid; flowers[8] solitary; peduncles long erect slender (*Oregon*[9]).

101. **Alyssum** L.[10]—Sepals equal at base, often rather short, erect

[1] L., *Gen.*, n. 810.—DC., *Prodr.*, i. 157.—ENDL., *Gen.*, n. 4864.—B. H., *Gen.*, 72, n. 26.

[2] White, yellow, purplish, or pale lilac (*Ricotia*).

[3] Spec. about 20. DELESS., *Ic. Sel.*, ii. t. 34.—BOISS., *Fl. Or.*, i. 157, 254 (*Ricotia*).—GREN. & GODR., *Fl. de Fr.*, i. 113.—*Bot. Reg.*, t. 49 (*Ricotia*).—WALP., *Rep.*, i. 139; ii. 36 (*Ricotia*), 757; *Ann.*, i. 31; ii. 36, 37; iv. 195; vii. 109.

[4] In *Journ. Acad. Philad.*, v. 132, t. 6.—A. GRAY, *Gen. Ill.*, t. 67.—B. H., *Gen.*, 72, n. 25.

[5] Yellow.

[6] Spec. 2. WALP., *Rep.*, i. 154; *Ann.*, vii. 108.

[7] *Fl. Bor.-Amer.*, i. 68, t. 18 B.—ENDL., *Gen.*, n. 4926.—B. H., *Gen.*, 72, n. 28 (nec HOFFM.).

[8] White, nearly of *Cardamine*.

[9] Spec. 1. *P. scapigerum* HOOK., *loc. cit.*

[10] *Gen.*, n. 805.—J., *Gen.*, 240.—DC., *Prodr.*, i. 160.—SPACH, *Suit. à Buffon*, vi. 476.—ENDL., *Gen.*, 4874.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 148.—B. H., *Gen.*, 73, 966, n. 34.

or patulous. Petals short, entire emarginate or 2-fid, orbiculate obovate or oblong. Stamens 6, 4-dynamous, free, all edentulous or variably callous or appendiculate. Siliqua short, very polymorphous, ovate-oblong obovate or elliptical, strongly compressed or tumid, sometimes conchoidal; style more or less elongated; apex simple stigmatose; valves flat, concave or more often convex, sometimes flat at margin and swelling at back; septum membranous, entire or fenestrate. Seeds few (1, 2) or ∞, campylotropous; embryo rather fleshy; cotyledons usually accumbent; funicles free or more or less adnate to septum.—Small shrubs or herbs, branching usually hoary with stellate down; branches thin or rigid; leaves scattered or radical crowded, usually entire, most frequently linear; flowers[1] ebracteate,[2] sometimes in short racemes (*Temperate and Southern Europe, the East, Siberia, Northern Africa, Australia*[3]).

102 ? **Alyssopsis** Boiss.[4]—Flowers nearly of *Alyssum*; petals subobovate. Stamens exappendiculate toothless. Siliqua oblong; valves convex ribbed; septum thin membranous; apex of style short capitate

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[1] Small, often inconspicuous; white or yellow.

[2] The genus, from the characters of its corolla stamens and fruit, is divided by the recent authors into 8 sections, thus: 1. *Eualyssum* " (*Alyssum* L.). Petals small. All or some of the stamens membranous appendiculate. Siliqua suborbiculate, convexo-concave or flat at margin; disk tumid; cells 2-seeded; seeds opposite.—2. *Odontarrhena* (C. A. Mey., in *Ledeb. Fl. Alt.*, iii. 58; *Ic. Fl. Ross.*, t. 143–257). Petals obovate. Stamens all membranous appendiculate. Siliqua rather flat subelliptical; cells 1-seeded. Flowers often subcorymbose (Walp., *Rep.*, i. 145.—*Aurinia* Desvx. (*Journ. Bot.*, iii. 162) is referred to this by De Candolle). — 3. *Ptilotrichum* (C. A. Mey., *loc. cit.*). Petals orbiculate. All the stamens simple. Siliqua rather flat subelliptical; cells 1-seeded. (Walp., *Rep.*, i. 145; *Ann.*, i. 33.)—4. *Psilonema* (C. A. Mey., *loc. cit.*, iii. 50;—Ledeb., *Ic. Fl. Ross.*, t. 202). Petals cuneate. Stamens all simple. Siliqua rotundate; valves turgid at middle; style slender; cells 2-seeded. (Walp., *Rep.*, i. 142.)—5. *Schiwereckia* (Andr., ex DC., *Syst.*, ii. 300). Petals obovate-oblong. Longer stamens dilated, with a tooth. Siliqua small ovate; valves depressed at middle; style slender; seeds very numerous. Leaves rosulate (Deless., *Ic. Sel.*, ii. t. 36.—Walp., *Rep.*, i. 142).—6. *Lobularia* (Desvx., *Journ. Bot.*, iii. 172;—*Kœniga* R. Br., in *Clappert. Voy. App.*, 214;—*Glyce* Lindl., *Syn. Brit. Fl.*, 26). Petals obovate. Stamens toothless, rarely dilated. Siliqua ovate; valves convex; septum 1-ribbed venose; cells 2–6-seeded; seeds often marginate; funicles adnate to septum at base. — Herbs; pubes appressed bipartite. (Reichb., *Ic. Fl. Germ.*, ii. t. 18 (*Kœniga*).—Walp., *Rep.*, i. 142; *Ann.*, i. 32; ii. 40.)—7. *Meniocus* (Desvx., *loc. cit.*, iii. 173.) Petals small. Stamens all with an internal squamule. Siliqua elliptical very much compressed; seeds very numerous immarginate; funicles sebaceous free. (Deless., *Ic. Sel.*, ii. 42.—Walp., *Rep.*, ii. 757; v. 46; *Ann.* i. 31.)—8. *Berteroa* (DC., *Syst. Veg.*, ii. 290; *Prodr.*, i. 158). Petals 2-fid. Stamens raised at base on an internal callus. Siliqua very much compressed; style slender; seeds few or very numerous, marginate or alate. (Deless., *Ic. Sel.*, ii. 37.—Walp., i. 140.)"—(B. H., *Gen.*, 74.)

[3] Spec. 80–90. Reichb., *Ic. Fl. Germ.*, ii. t. 18–21.—Tchihatch., *As. Min.*, *Bot.*, i. 296.—Boiss., *Fl. Or.*, i. 263, 289 (*Kœniga*), 290 (*Berteroa*), 291 (*Schiwereckia*). — Benth., *Fl. Austral.*, i. 71.—Gren. & Godr., *Fl. de Fr.*, i. 114.—Walp., *Rep.*, i. 142; ii. 757; v. 36; *Ann.*, i. 32; ii. 40; iv. 197; vii. 113.

[4] *Diagn. Or.*, vi. 14.—B. H., *Gen.*, 74, n. 35.

stigmatose. Seeds ∞, 1-seriate immarginate.—A cæspitose herb hoary with stellate down; leaves entire; flowers[1] in short ebracteate racemes, rather long-pedicellate (*Alpine Persia*[2]).

103. **Draba** L.[3]—Sepals short, equal at base. Petals usually short sometimes sessile, narrowed at base, entire, emarginate or 2-partite (*Erophila*[4]). Stamens 6, free. Siliqua elliptical or more rarely oval (*Petrocallis*[5]), oblong sometimes elongated (*Dollineria*[6]) rarely linear compressed, usually 2-valved, in 1 species (*Holargidium*[7]) 4-valved, with many or few seeds; style erect, short or elongated; apex stigmatose capitate simple, valves very flat, very rarely (*Dollineria*) ribbed at middle; septum membranous. Seeds few or ∞, 2-seriate immarginate; funicles bristly free (*Erophila*), or rarely adnate to septum (*Petrocallis*); cotyledons accumbent or more rarely incumbent.—Herbs usually small, cæspitose, hoary with stellate down; stems either naked scapes or leafy; leaves entire; radical rosulate; cauline sessile; flowers[8] in short or elongated racemes; pedicel slender, ebracteate[9] (*Temperate Alpine and Arctic regions of Northern Hemisphere, South-West Australia*[10]).

104? **Stenonema** Hook.[11]—"Sepals suberect, equal at base. Petals large emarginate serrate. Filaments filiform toothless. Siliqua (unripe) ovate, very much compressed, 2-celled; valves flat;

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[1] "Yellow, open."

[2] Spec. 1. *A. Kotschyi* Boiss., *loc. cit.*; *Fl. Or.*, i. 182.—Walp., *Ann.*, i. 29 (part.).

[3] *Gen.*, n. 800.—Adans., *Fam. des Pl.*, ii. 421.—J., *Gen.*, 240.—Lamk., *Dict.*, ii. 325; Suppl., ii. 524 (part.); *Ill.*, t. 556.—DC., *Prodr.*, i. 166.—Endl., *Gen.*, n. 4880.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 149.—A. Gray, *Gen. Ill.*, t. 68, 69.—B. H., *Gen.*, 74, n. 37.

[4] DC., *Syst.*, ii. 356; *Prodr.*, i. 172.—A. Gray, *Gen. Ill.*, t. 69.—Reichb., *Ic. Fl. Germ.*, ii. t. 12.—B. H., *Gen.*, 75, n. 37.

[5] R. Br., in *Ait. Hort. Kew.*, ed. 2, iv. 93.—DC., *Prodr.*, i. 166.—Reichb., *Ic. Fl. Germ.*, ii. t. 16.—Endl., *Gen.*, n. 4879.

[6] Sauter, in *Flora* (1852), 353.

[7] Turcz., in *Ledeb. Fl. Ross.*, i. 156.

[8] Usually small, white, gold-coloured, pink, lilac, or purplish.

[9] The genus, from the characters and colour of its root and leaves, is divided into 4 sections by recent authors. (B. H., *loc. cit.*) "a. *Aizopsis.* Root strong many-crowned. Leaves rosulate rather rigid ciliate, traversed by a strong rib below. Flowers white or golden.—b. *Chrysodraba.* Root strong many-crowned. Leaves rosulate, coriaceous or membranous, hairy or tomentose; rib not prominent below. Flowers golden, rarely white.—c. *Leucodraba* (incl. *Holargea* Auctt.). Root biennial or perennial, oftener many-crowned. Leaves soft flat neither rigid nor keeled. Flowers white.—d. *Drabella.* Annual. Stem or scape leafy. Flowers white or yellow. Capsule often many-seeded."

[10] Reichb., *Ic. Fl. Germ.*, ii. 12–16.—Boiss., *Fl. Or.*, i. 292.—Triana & Pl., in *Ann. Sc. Nat.*, sér. 4, xvii. 61.—Gren. & Godr., *Fl. de Fr.*, i. 121.—Walp., *Rep.*, i. 147; ii. 758; *Ann.*, i. 34; ii. 43; iv. 198; vii. 120, 126 (*Erophila*).

[11] Ex Hook. f., *Gen.*, 75, n. 39.—*Leptonema* Hook., *Icon.*, t. 692 (nec A. Juss.).—Walp., *Rep.*, v. 37.—*Dolichostylis* Turcz., in *Bull. Mosc.* (1854), ii. 305.

septum membranous; cells sub-8-spermous; style very long-exserted; stigma capitellate. Seeds ovate pendulous, 2-seriate; funicles filiform free.—A branching herb, woody at base; branches short leafy glandular hairy; leaves subrosulate linear entire subcarneous glabrous; flowers[1] racemose long-pedicellate nodding; pedicels slender, bracteate at base; bracts linear[2] (*New Granada*[3]).

105? **Odontocyclus** TURCZ.[4]—"Sepals equal at base. Petals emarginate. Stamens toothless, dilated at base. Siliqua sessile orbiculate; valves flat, dentate at edge, not keeled; replum included. Seeds 2, 3 in each cell, immarginate.—A small plant, covered (except on petals and silicules) with simple or branching patent hairs; cauline leaves sessile cuneate-rhomboid, irregularly incised at apex; racemes very numerous, axillary and terminal, with many flowers, ebracteate; pedicels 2 or 3 times length of siliqua"[5] (*Kurile Islands*[6]).

106. **Cochlearia** L.[7]—Sepals short subequal lax. Petals unguiculate imbricated. Stamens 6, 4-dynamous, or all subequal; filaments free, upright or geniculate, or 4-longer arched at apex (*Kernera*[8]). Hypogynous glands 4, oppositipetalous. Siliqua sessile or shortly stipitate oblong or globose, sometimes turgid (*Kernera*), rarely laterally compressed very rarely very flat; style erect short or more or less elongated, at apex stigmatose, dilatate or capitellate; valves frequently ventricose, sometimes very convex (*Kernera*), or tumid membranous laxly reticulate ribless (*Taphrospermum*[9]), or oftener venose, seldom ribbed. Seeds ∞, or few (*Taphrospermum*) 2-seriate or more rarely 1-seriate (*Taphrospermum*), immarginate; testa smooth or tuberculate; cotyledons accumbent or more rarely incumb-

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[1] "Dry yellow."

[2] "A genus of doubtful affinities, the fruit of the specimens being unripe (perhaps allied to *Porphyrocodon* ?)."

[3] Spec. 1. *S. Lindeni* HOOK. F.

[4] In *Ledeb. Fl. Ross.*, i. 756 (whence our description).—B. H., *Gen.*, 75, n. 38.

[5] "Petals white."

[6] Spec. 1. *O. curilensis* TURCZ.

[7] *Gen.*, n. 803.—ADANS., *Fam. des Pl*, ii. 421.—J., *Gen.*, 240.—LAMK., *Dict.*, ii. 164 (part.).—DC., *Prodr.*, i. 172.—SPACH, *Suit. à Buffon*, vi. 499.—ENDL., *Gen.*, n. 4882.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 154.—B. H., *Gen.*, 75, 966, n. 40.—*Roripa* BESS., *Fl. Volhyn.* (1822) (part.—see p. 228, note 3).—? *Armoracia* GÆRTN. (P. G.), MEY. & SCHERB., *Fl. Vett.*, ii. 426 (1799), ex KOCH, *Syn. Fl. Germ.*, 66.

[8] MEDIK., ex DC., *Syst. Veg.*, ii. 359.—REICHB., *Ic. Fl. Germ.*, ii. t. 17.

[9] C. A. MEY., in *Ledeb. Fl. Alt.*, iii. 172; *Ic. Fl. Ross.*, . 320.—*Rhizobotrya* TAUSCH, in *Flora* (1836), 33.

ent (*Kernera, Chrysochamela*[1]).—Herbs, frequently perennial, glabrous, varying in habit; leaves alternate, rarely rosulate,[2] entire or pinnatipartite; flowers[3] in ebracteate racemes simple or branching more rarely in leafless solitary scapes (*Temperate and cold Regions of Northern Hemisphere*[4]).

107? **Pringlea** HOOK. F.[5]—Flowers usually those of *Cochlearia* (?); sepals equal oblong. Petals and stamens . . . ? Siliqua oblong- or ellipsoid-cylindrical, rather large turgid, 1-celled; style short, apex stigmatose capitellate; valves concave ribbed; septum 0 or very incomplete. Seeds ∞, crowded ovoid; testa thick, spongy-fleshy outside; chalaza acute or acuminate; cotyledons of fleshy embryo subobovate accumbent.—A pubescent herb;[6] rhizome thick elongated prostrate; leaves cuneate-rotundate, thickly imbricate into a globe, entire concave; "scape thick, simple; raceme when fruiting erect upright thick, ebracteate"[7] (*Kerguelen's Land*[8]).

108. **Vesicaria** LAMK.[9]—Sepals equal, or lateral saccate at base. Corolla of *Alyssum* (or more rarely of *Cheiranthus*). Siliqua globose or inflated, crustaceous or more rarely membranous (*Physoptychis*[10]), sometimes laterally compressed or more rarely 2-dymous,[11] obtuse or obcordate at both ends; septum hyaline; style slender; apex simple or 2-lobed; lobes stigmatose erect or more rarely connivent (*Clastopus*[12]). Seeds ∞, sometimes marginate; funicles adnate at base to septum.[13]—Herbs usually branching, hoary with short branching or forked hairs; leaves entire, sinuate or pinnatifid; flowers[14]

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1 BOISS., *Fl. Or.*, i. 313.

2 In a few Oriental species.

3 White, more rarely yellow or violet.

4 Spec. about 25. REICHB., *Ic. Fl. Germ.*, ii. t. 17.—DELESS., *Ic. Sel.*, ii. t. 47–49.—GREN. & GODR., *Fl. de Fr.*, i. 127.—BOISS., *Fl. Or.*, i. 245.—WALP., *Rep.*, i. 153, 171 (*Taphrospermum*); *Ann.*, i. 37; ii. 200; vii. 127.

5 *Fl. Antarct.*, ii. 238, t. 90, 91.—B. H., *Gen.*, 76, n. 41.

6 "Brassicoid."

7 "A genus hardly distinct from *Cochlearia*, except by habit and seeds, with thick testa of seeds."

8 Spec. 1. *P. antiscorbutica* HOOK. F., *loc. cit.*—WALP., *Ann.*, i. 43.

9 *Ill.*, t. 559.—DC., *Prodr.*, i. 159.—SPACH, *Suit. à Buffon*, vi. 473.—ENDL., *Gen.*, n. 4869.—A. GRAY, *Gen. Ill.*, t. 70.—B. H., *Gen.*, 73, n. 32.—*Cystocarpum* SPACH, *loc. cit.*, 471.

10 BOISS., *Fl. Or.*, i. 260.

11 Sect. *Physaria* (NUTT.). Gen. propr., ex A. GRAY, in *Sillim. Journ.*, xxxiii. 14.

12 BGE., ex BOISS., *Fl. Or.*, i. p. 261.

13 In section *Physaria* (NUTT., ex B. H.), septum narrow and siliqua much compressed; cotyledons across septum.

14 Large, or more rarely rather small; yellow or purple.

racemose, ebracteate[1] (*South Europe, Persia, North and South America*[2]).

109. **Coluteocarpus** Boiss.[3]—Flowers nearly of *Alyssus;* sepals equal erect. Siliqua subglobose-inflated vesiculose, hardly dehiscent at apex; valves tumid membranous; reticulate; mid-rib strong; septum membranous, disappearing above; style short; apex stigmatose capitate. Seeds few immarginate; funicles adnate to septum, unthickened at base.—A low subcæspitose glabrous herb; leaves linear-oblong; radicals crowded, entire or toothed; flowers[4] in short terminal racemes (*Alpine Asia Minor*[5]).

110. **Aubrieta** Adans.[6]—Lateral sepals usually saccate at base. Petals nearly of *Cheiranthus.* Stamens smaller either all enlarged by tooth at base within, or frequently inflated within and laterally subalate with epidermis. Glands lateral large subquadrate. Siliqua[7] linear, globose or oblong; valves unribbed; septum transparent; style thin straight, apex capitate stigmatose entire. Seeds ∞, 2-seriate, immarginate.—Perennial hoary-tomentose subcæspitose herbs; leaves entire or unequal-dentate; flowers[8] ebracteate in long pedicellate few-flowered racemes (*Italy, Greece, Asia Minor, Persia*[9]).

111. **Grællsia** Boiss.[10]—Sepals patulous short, subequal at base. Petals orbicular or obovate, long-unguiculate. Stamens 6, free. Siliqua oblong-lanceolate or obovate, much compressed stipitate; style straight; apex stigmatose capitellate; valves membranous, thinly 3-ribbed; replum fragile; septum soon disappearing. Seed 1,

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[1] A genus midway in fruit, as it were, between *Alyssum* and *Coluteocarpus.*

[2] Spec. about 20. Deless., *Ic. Sel.*, ii. t. 35.—Boiss., *Fl. Or.*, i. 262.—Gren. & Godr., *Fl. de Fr.*, i. 113.—Eichl., in *Mart. Fl. Bras., Crucif.*, 302, t. 67.—Walp., *Rep.*, i. 140; *Ann.*, i. 32; ii. 37; iv. 195; vii. 112.

[3] In *Ann. Sc. Nat.*, sér. 2, xvii. 162; *Fl. Or.*, i. 306.—B. H., *Gen.*, 73, n. 33.—*Lagowskia* Trautv., in *Bull. Acad. Petrop.* (1857), 620.

[4] White or pale purple.

[5] Spec. 1. *C. Vesicaria.*—*C. reticulatus* Boiss., *loc. cit.*—Walp., *Rep.*, i. 141.—*Vesicaria reticulata* Lamk., *Ill.*, t. 559, fig. 2.—DC., *Prodr.*, i. 159, n. 2.—*Alyssum Vesicaria* L., *Spec.*, 910.

[6] *Fam. des Pl.*, ii. 420.—*Aubrietia* DC., *Syst.*, ii. 293; *Prodr.*, i. 158.—Spach, *Suit. à Buffon*, vi. 466.—Endl., *Gen.*, n. 4868.—B. H., *Gen.*, 73, n. 31.

[7] Sometimes varying in the same species.

[8] Purple or violet; often rather large.

[9] Reichb., *Pl. Crit.*, iii. 235.—Griseb., *Spicil.*, i. 268.—Sibth., *Fl. Græc.*, t. 628 (*Alyssum*), 630, 643 (*Arabis*).—Boiss., *Fl. Or.*, i. 249.—Walp., *Rep.*, i. 140; ii. 757; *Ann.*, i. 31; ii. 37; iv. 195; vii. 110.

[10] In *Ann. Sc. Nat.*, sér. 2, xvii. 172.—B. H., *Gen.*, 72, n. 29.

large immarginate; funicle slender free.—A perennial herb; rhizome woody thick wrinkled; crown stupose with bases of old leaves; leaves long-petiolate, largely crenate; flowers[1] corymbose-racemose at top of erect naked scape; pedicels slender elongated patent, ebracteate[2] (*Persia*[3]).

112. **Buchingera** Boiss. & Hohen.[4]—Sepals equal at base, patulous. Petals subspathulate entire. Stamens 6, toothless. Siliqua orbicular, much flattened, rather hispid; style persistent subulate; apex stigmatose shortly 2-lobed; valves ribless net-veined, papillose outside; septum hyaline. Seeds solitary in each cell, inserted a little below apex, descending orbicular much compressed marginate-alate.—A small annual leafy herb,[5] hoary at apex with branching or glochidiate hairs; leaves oblong dentate petiolate; flowers[6] axillary; pedicels curved (*Persia*[7]).

b. Camelininеæ.—*Cotyledons usually incumbent.*

113. **Camelina** Crantz.[8]—Sepals equal short. Stamens 6, free toothless. Siliqua short obovoid, abruptly tapering into style; valves turgid, strongly concave within, produced at apex beside base of style to a short reflexed apiculus; margin often rather flat; replum linear rather prominent subcarinate; septum obovate, nearly as broad as valves, membranous entire; style at apex stigmatose minutely capitate entire. Seeds ∞, 2-seriate immarginate; funicles short, bristly at base, adnate to septum or nearly free; fleshy embryo; cotyledons incumbent.—Annual erect herbs glabrous or furcately pilose; inferior leaves often pinnatifid; superior entire, cordate-auriculate at base; flowers[9] racemose, ebracteate (*Middle and Southern Europe, West Temperate Asia*[10]).

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[1] White.

[2] An anomalous plant. Habit of many Saxifrages. Inflorescence of *Isatis*.

[3] Spec. 1. *G. saxifragifolia* Boiss., *loc. cit.*; *Fl. Or.*, i. 306.—Deless, *Ic. Sel.*, ii. t. 50.—Walp., *Rep.*, i. 154; *Ann.*, vii. 108.—*Cochlearia ? saxifragifolia* DC., *Syst.*, ii. 370.

[4] *Diagn. Pl. Or.*, viii. 29.—B. H., *Gen.*, 72, n. 30.

[5] Aspect of *Asperugo*.

[6] White.

[7] Spec. 1. *B. axillaris* Boiss., *loc. cit.*; *Fl. Or.*, i. 305.—Walp., *Ann.*, ii .41.

[8] *Fl. Austr.*, i. 17.—DC., *Prodr.*, i. 201.—Spach, *Suit. à Buffon*, vi. 122.—Endl., *Gen.*, n. 4919.—B. H., *Gen.*, 83, n. 72.

[9] Small, yellow.

[10] Spec. 1 (or, according to some authors, 5–10,

114. **Menkea** LEHM.[1]—Sepals short, patulous, equal at base. Petals short, much contracted at base. Stamens 6; filaments free, slightly dilated at very base, toothless. Siliqua elliptical or linear-oblong obtuse, strongly compressed; style short; apex stigmatose subcapitate or subemarginate; valves very flat submembranous, 1-ribbed reticulately venose; septum thin, sometimes nearly absent or edging replum. Seeds ∞, small, 2-seriate striated immarginate; funicles capillary, sometimes very long; embryo rather fleshy; cotyledons incumbent.—Annual herbs, thin slender banching, glabrous or puberulous; leaves alternate entire linear, generally few; flowers[2] ebracteate in short racemes (*South Western Australia*[3]).

115? **Sphærocardamum** SCHAU.[4]—Sepals 4, patulous equal. Petals narrow. Stamens toothless. Siliqua[5] subglobose, slightly marginate, 4-seeded; valves strongly convex, obscurely 1-ribbed at back; septum entire; style persistent. Seeds pendulous immarginate smooth; funicles very short; cotyledons incumbent flat across septum.—A small annual or biennial herb,[6] erect branching above, hoary-hairy; leaves linear-lanceolate sessile, quite entire or repand denticulate; racemes[7] elongated bare ebracteate[8] (*Mexico*[9]).

116. **Geococcus** J. DRUMM.[10]—Sepals short patulous, equal at base. Petals small. Siliqua[11] oblong subcompressed obtuse; valves ribbed; septum . . . . ?; replum broad; stigma sessile simple. Seeds few sub-2-seriate oblong immarginate; funicles elongated.—A low depressed glabrous herb; leaves all radical stellate spreading submembranous, pinnatifid or pinnatisect; flowers subsessile[12] (*South Western Australia*[13]).

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perhaps varieties of one). *C. sativa* FR., *Nov. Mant.*, iii. 72.—REICHB., *Ic. Fl. Germ.*, ii. t. 24.—BOISS., *Fl. Or.*, i. 311.—GREN. & GODR., *Fl. de Fr.*, i. 130.—WALP., *Rep.*, i. 173; v. 40.—*C. sylvestris* WALLR., *Sched.*, 347.—*Myagrum sativum* C. BAUH., *Pin.*, 109.

[1] *Ind. Sem. Hort. Hamburg.* (1843), 8.—B. H., *Gen.*, 83, n. 75.

[2] Small, white.

[3] Spec. 2. HOOK., *Icon.*, t. 610, 617 (*Stenopetalum*).—F. MUELL., *Fragm.*, ii. 142; *Pl. Vict.*, i. 222.—BENTH., *Fl. Austral.*, i. 80.—WALP., *Rep.*, v. 41.

[4] In *Linnæa*, xx. 720.—B. H., *Gen.*, 83, n. 73 (whence our description).

[5] "Very small, hoary."

[6] "Habit of *Neslia*."

[7] "Flowers very small, whitish or pale yellow."

[8] "Perhaps rather allied to *Lepidium*." (B. H., *loc. cit.*)

[9] Spec. 1. *S. neslïæforme* SCHAU., *loc. cit.*—WALP., *Ann.*, i. 43.

[10] Ex HARV., *New Gen. of W. Austral. Pl.*, in *Hook. Journ.*, vii. 52.—B. H., *Gen.*, 83, n. 71.

[11] When ripening hidden in the earth.

[12] "Very small, white."

[13] Spec. 1. *G. pusillus* J. DRUMM., *loc. cit.*—WALP., *Ann.*, iv. 208.

117. **Stenopetalum** R. Br.[1]—Sepals erect linear subequal at base, or lateral slightly saccate. Petals elongate, long-tapering at base, sometimes twisted. Stamens 6; anthers elongate, sometimes twisted. Siliqua scarcely or shortly stipitate, terete subglobose or linear-elongated compressed; style short rudimentary; apex stigmatose slightly thickened simple; valves convex or rather flat, ecostate; septum membranous. Seeds ∞, 2-seriate minute immarginate; cotyledons incumbent or obliquely accumbent; funicles slender free.—Annual thin branching glabrous herbs; branches virgate; leaves linear, entire or pinnatisect; flowers[2] in (sometimes subspicate) racemes (*Australia*[3]).

118. **Tropidocarpum** Hook.[4]—Sepals equal at base. Petals rather short, contracted at base. Siliqua linear-elongated, rather terete or laterally compressed; style short erect; apex stigmatose capitellate; valves convex submembranous, ecostate or costate by midrib; septum 0. Seeds ∞, 2-seriate immarginate; funicles free.—Annual herbs, erect branching slender, hairy or tomentulose; leaves pinnatisect; flowers[5] axillary solitary pedunculate (*California*[6]).

119? **Blennodia** R. Br.[7]—Sepals short patulous, equal or subsaccate at base. Petals short or elongated, long-tapering at base. Siliqua linear or linear-oblong, subterete, 4-gonous, or subcompressed; style short or very short; apex stigmatose simple; valves convex, keeled or ribless; septum more or less thick, sometimes rugose. Stamens ∞, 1, 2-seriate oblong immarginate;[8] funicles free.—Annual herbs, erect branching, hoary-pubescent or subglabrous; leaves entire or pinnatifid; flowers in ebracteate racemes[9] (*Australia*[10]).

120. **Mathewsia** Hook.[11]—Sepals equal at base, erect keeled.

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[1] Ex DC., *Syst. Veg.*, ii. 513; *Prodr.*, i. 201.—Endl., *Gen.*, n. 4920.—B. H., *Gen.*, 82, 967, n. 68.

[2] Orange-coloured.

[3] Spec. 6. Hook., *Icon.*, t. 618, 620.—Benth., *Fl. Austral.*, i. 77.—Walp., *Rep.*, i. 174; v. 40.

[4] *Icon.*, t. 43, 52.—Endl., *Gen.*, n. 4907.—B. H., *Gen.*, 82, n. 69.

[5] White.

[6] Walp., *Rep.*, i. 167.

[7] In *Sturt Exped. App.*, 67.—B. H., *Gen.*, 82, 967, n. 67.

[8] "When moistened densely fibrous-mucous." (B. H., *loc. cit.*)

[9] Is the genus sufficiently distinct from *Capsella*? The flowers are nearly the same; the fruit hardly differs in form.

[10] Spec. 11. F. Muell., *Fl. Vict.*, t. 2.—Benth., *Fl. Austral.*, i. 73.—Walp., *Ann.*, ii. 48; vii. 145.

[11] *Bot. Misc.*, iii. 140, t. 96.—Endl., *Gen.*, n. 4922.—B. H., *Gen.*, 81, n. 64.

Petals oblong-lanceolate, twisted at base, long-unguiculate. Stamens free. Siliqua elliptical or lanceolate compressed; style very short; apex stigmatose, globose or subconical; valves flat reticulate; septum membranous or spongy (*Machærophorus*[1]). Seeds ∞, 2-seriate immarginate; embryo sometimes coloured; cotyledons incumbent.—Undershrubs, branching leafy hoary tomentose; leaves entire or pinnatifid; flowers[2] racemose ebracteate terminal (*Chili*, *Peru*[3]).

121. **Ammosperma** Hook. f.[4]—Sepals erect; lateral more or less saccate at base. Petals obovate, long-unguiculate. Stamens 6, 4-dynamous; filaments free toothless. Siliqua very shortly stipitate, narrowly linear elongated compressed; style short; apex stigmatose capitellate subtruncate; valves flat minutely torulose, sometimes depressed at middle; septum hyaline. Seeds ∞, minute, 2-seriate oblong-compressed; embryo rather fleshy (coloured); cotyledons incumbent.—A much branched hoary pubescent herb; branches terete leafy; leaves pinnatifid; flowers[5] in terminal racemes, remotely alternate; pedicles slender, ebracteate (*Tunis*[6]).

122. **Leptaleum** DC.[7]—Sepals linear erect, subequal at base. Petals linear-angustate. Stamens 6; longer connate in pairs. Siliqua linear sessile, weakly dehiscent or indehiscent; style short conoidal; lobes 2, stigmatose connate; valves rather flat coriaceous, 1-ribbed, net-veined; septum complete excavated subfungous. Seeds ∞, close, 2-seriate small, broadly oblong obtuse, echinulate outside.—A small annual much branching herb; branches thin; leaves linear or filiform, entire or multifid; flowers[8] axillary, or in short subspicate few-flowered racemes (*The East*[9]).

c. Succovineæ.—*Cotyledons usually conduplicate.*

123. **Succovia** Medik.[10]—Sepals erect, hardly unequal at base,

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[1] Schltl., in *Linnæa*, xxviii. 469.

[2] Rather large, nearly of *Matthiola* or *Cheiranthus*.

[3] Spec. 3. Barn., in *C. Gay Fl. Chil.*, i. 152.—Walp., *Rep.*, i. 174; *Ann.*, vii. 144.

[4] *Gen.*, 82, n. 66.

[5] Purple.

[6] Spec. 1. *A. cinerea.*—*Sisymbrium cinereum* Desf., *Fl. Atl.*, t. 157.

[7] *Syst. Veg.*, ii. 510; *Prodr.*, i. 200.—Endl., *Gen.*, n. 4913.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 168.—B. H., *Gen.*, 81, n. 65.

[8] White, small.

[9] Spec. 1. *L. filifolium* DC., *loc. cit.*—Deless., *Ic. Sel.*, ii. t. 68.—Boiss., *Fl. Or.*, i. 242.

[10] Ex DC., *Syst. Veg.*, ii. 642; *Prodr.* i., 224.—Endl., *Gen.*, n. 4960.—B. H., *Gen.*, 86, n. 87.

acute at apex. Stamens free. Siliqua erect globose-2-dymous; valves hemispherical, echinate outside; beak subulate conoid sub-4-gonous; apex stigmatose capitate; septum 2-lamellate, fenestrate or subentire. Seeds solitary in each cell, descending from free setaceous funicle, rather large globose glabrous; embryo rather fleshy; cotyledons thick, 2-lobed conduplicate.—An annual branching glabrous herb; leaves pinnatisect; lobes dentate or pinnatifid; racemes leaf-opposed[1] (*Mediterranean, Canary Islands*[2]).

124? **Pachycladon** HOOK. F.[3]—"Stamens free toothless. Siliqua elliptical or linear-oblong, compressed; valves cymbiform keeled wingless; septum imperfect; style very short; stigma capitate, 2-lobed; cells 3–5-seeded. Seeds ovoid; funicles short; cotyledons incumbent.—A depressed herb; stock short very thick, simple or with thick short branches covered with scars of leaves; leaves rosulate pinnatifid; scapes or peduncles ∞ from stock, arising below the leaves, spreading, 3–5-flowered" (*New Zealand*[4]).

125. **Vella** L.[5]—Sepals equal at base, erect. Stamens 6; anthers unguiculate at apex; filaments of larger high-connate in pairs, subpetaloid. Siliqua erect ovate-2-dymous; beak broadly foliaceous, rather rigid; apex stigmatose shortly 2-lobed; valves very convex; septum thin pellucid. Seeds few, 1, 2 in each cell, descending subglobose; embryo nearly of *Brassica*.—Small shrubs, woody at base, rigid, very branching, sometimes spinescent; leaves entire; flowers[6] in racemes (sometimes spiciform); lower pedicels bracteate (*Spain*[7]).

126. **Carrichtera** ADANS.[8]—Flowers nearly of *Vella*. Siliqua short turgid; beak foliaceous subcochlear; valves subhemispherical turgid, rugose outside; septum membranous frequently torn; stigma sessile. Seeds 2–4 in each cell, descending, subglobose or rather com-

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1 "A genus very nearly allied to *Boleus*." (B. H., *loc. cit.*)

2 Spec. 1. *S. balearica* MEDIK., ex DC., *loc. cit.*

3 *Handb. N.-Zeal. Fl.*, 724.—B. H., *Gen.*, 967, n. 87 *a*.

4 Spec. 1. *P. N.-Zelandiæ* HOOK. F., *loc. cit.*

5 *Gen.*, n. 797.—J., *Gen.*, 241.—DC., *Prodr.*, i. 223.—SPACH, *Suit. à Buffon*, vi. 529.—ENDL., *Gen.*, n. 4957.—B. H., *Gen.*, 85, n. 85.

6 Rather large, yellow.

7 Spec. 8. BOISS., *Voy. Bot. Esp.*, t. 10.—*Bot. Reg.*, t. 293.—WALP., *Rep.*, i. 189.

8 *Fam. des Pl.*, ii. 421.—DC., *Syst. Veg.*, ii. 641; *Prodr.*, i. 224.—ENDL., *Gen.*, n. 4959.—B. H., *Gen.*, 86, n. 86.

pressed; embryo herbaceous; cotyledons emarginate conduplicate; radicle incumbent.—An annual branching herb; leaves pinnatisect, lobes entire or pinnatisect; racemes[1] leaf-opposed; pedicels ebracteate slender, when fruiting nutant (*Europe, and Middle Asia*[2]).

VI. THLASPIDEÆ.

a. Iberidineæ.—*Cotyledons usually decumbent.*

127. **Thlaspi** Dillen.—Sepals equal at base, erect. Petals equal or subequal obovate. Stamens 6, free exappendiculate. Siliqua short, laterally compressed, oblong, obcordate or obcuneate, acuminate or more rarely acute at apex; style more or less elongated erect; apex stigmatose emarginate; valves keeled or winged, more rarely wingless (*Carpoceras*); septum narrow membranous. Seeds ∞, or more frequently 2 in each cell, immarginate.—Annual or perennial herbs, glabrous or glaucous, more rarely pilose; radical leaves rosulate entire or dentate; cauline oblong hastate-auriculate; flowers ebracteate in racemes sometimes corymbose-scapose (*Temperate, Alpine, and Arctic regions, especially of Northern Hemisphere, South America and Australia*). See p. 203.

128. **Iberis** L.[3]—Sepals equal at base, or slightly saccate at base. Petals 4, unequal; anterior 2 much larger than posterior.[4] Stamens 6, free; filaments exappendiculate, rather thick. Placentary glands small or 0; carpellary in pairs internal to smaller stamens, connate to each other or free. Siliqua flat-compressed at base, ovate or rotundate, at apex entire or emarginate; valves keeled, winged or marginate; septum narrow, 2-lamellate; style short or long; apex stigmatose, subcapitate or emarginate. Seeds solitary in each cell, immarginate descending; radicle accumbent dorsal, ascending or sub-horizontally superior.—Glabrous herbs or undershrubs, rather fleshy

[1] Rather large, reddish white.

[2] Spec. 1. *C. annua*.—*C. Vellæ* DC., *loc. cit.*—Boiss., *Fl. Or.*, i. 397.—*Vella annua* L., *Spec.*, 895.—Gærtn., *Fruct.*, ii. 886, t. 141.—Sm., *Engl. Bot.*, t. 1442.

[3] *Gen.*, n. 804.—DC., *Prodr.*, i. 178.—Spach, *Suit. à Buffon*, vi. 559.—Endl., *Gen.*, n. 4887.—B. H., *Gen.*, 92, n. 117.

[4] Whereby the genus is distinguished from *Thlaspi*, but the flowers and fruit are the same.

branching; leaves entire or pinnatifid; flowers[1] racemose or corymbose, ebracteate, outer ones radiating (*Central and Southern Europe, Asia Minor*[2]).

129. **Teesdalia** R. Br.[3]—Flowers nearly of *Thlaspi*. Petals all equal, or exterior larger. Stamens 6, 4-dynamous, or lateral deficient, all with a squamule at base, toothless. Siliqua suborbicular or broadly obovate, emarginate or 2-lobed; style short; apex stigmatose entire; valves boat-shaped thinly winged. Seeds usually 2 in each cell, smooth.—Annual herbs, rather small glabrous; leaves rosulate pinnatifid; flowers[4] racemose or subcorymbose on top of bare or sparingly foliate scape (*Mediterranean, Eastern Europe, Asia Minor*[5]).

130. **Iberidella** Boiss.[6]—Sepals erect linear-elongated, equal at base. Petals equal, contracted into a long claw. Stamens 6, free toothless. Siliqua oblong or sublanceolate compressed, acute or acuminate; style elongated rigid subulate; apex stigmatose emarginate; valves keeled or subalate; septum narrow membranous. Seeds 1–6 in each cell, descending, oblong immarginate; cotyledons accumbent on cylindrical ascending radicle, sometimes oblique.—Undershrubs or herbs, branching at base, glabrous; leaves alternate or opposite entire, cauline usually cordate sagittate or auriculate, sometimes coriaceous thick; flowers[7] in ebracteate racemes (*East Himalayas*[8]).

131. **Hutchinsia** R. Br.[9]—Flowers nearly of *Thlaspi*; sepals short, equal at base. Petals equal small unguiculate. Stamens 6, free exappendiculate. Siliqua rather small broadly oblong obtuse,

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1 White or purplish.

2 Spec. about 20. Reichb., *Ic. Fl. Germ.*, ii. t. 7.—Boiss., *Fl. Or.*, i. 333.—Gren. & Godr., *Fl. de Fr.*, i. 136.—Walp., *Rep.*, i. 156; ii. 759; *Ann.*, i. 38; ii. 46; iii. 817; iv. 202; vii. 168.

3 In *Ait. Hort. Kew.*, ed. 2, iv. 83.—DC., *Prodr.*, i. 178.—Endl., *Gen.*, n. 4886.—B. H., *Gen.*, 92, n. 118.

4 White, very small.

5 Spec. 2. Reichb., *Ic. Fl. Germ.*, ii. t. 6.—Gren. & Godr., *Fl. de Fr.*, i. 141.—Boiss., *Fl. Or.*, i. 339.

6 In *Ann. Sc. Nat.*, sér. 2, xvii. 188.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 177.—B. H., *Gen.*, 93, n. 121.—*Syrenopsis* Jaub. & Spach, *Ill. Pl. Or.*, i. t. 3.

7 White or pink.

8 Spec. about 6. Boiss., *Fl. Or.*, i. 342.—Walp., *Rep.*, i. 171 (*Syrenopsis*), 175.

9 In *Ait. Hort. Kew.*, ed. 2, iv. 82.—DC., *Prodr.*, i. 177.—Endl., *Gen.*, n. 4931.—B. H., *Gen.*, 92, n. 120.—*Hornungia* Reichb., *Ic. Fl. Germ.*, ii. t. 6.

strongly compressed; style nearly absent, stigmatose emarginate; valves exalate keeled; septum membranous. Seeds in single cells 2, descending oblong compressed immarginate; funicles elongated slender; cotyledons of rather fleshy embryo accumbent.—A small glabrescent annual herb; leaves radical rosulate pinnatilobate; flowers[1] shortly racemose subcorymbose at top of ascending leafy scapes; pedicels ebracteate elongated; when fruiting patent[2] (*Europe*[3]).

132? **Redowskia** CHAM. & SCHLTL.[4]—"Sepals patulous, equal at base. Petals obovate obtuse. Stamens toothless. Siliqua (unripe) inflated compressed-globose, laterally compressed, tapering at base; valves 1-ribbed; septum 0; style slender; stigma capitate, 2-lobed. Seeds (unripe) 8–12.—A perennial herb, hoary-tomentose; hairs short, simple and forked; root thick; collar fibrous; stem terete, above branching leafy; leaves pinnate; leaflets incised or dentate; racemes[5] terminal; pedicels slender, ebracteate"[6] (*Eastern Siberia*[7]).

133. **Synthlipsis** A. GRAY.[8]—Sepals laxly linear, equal at base. Petals oblong-obovate undulate, broadly unguiculate. Siliqua elliptical-oblong, laterally compressed, emarginate; style slender erect; apex stigmatose depressed-capitate; valves acutely keeled wingless, marginate at apex; septum broad linear, 1-ribbed. Seeds ∞, 2-seriate, orbiculate-compressed immarginate; funicles free; cotyledons flat, accumbent across septum.—A diffuse branching herb, stellate-pubescent; leaves sinuate-pinnatifid; flowers[9] in lax racemes; fruiting pedicels patulous or recurved (*Texas, New Mexico*[10]).

134. **Lyrocarpa** HARV.[11]—Sepals elongate; lateral shortly saccate

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1 Small, white.

2 A genus very near to *Capsella*, on the one hand, which differs in number of seeds and usually incumbent cotyledons; to *Iberidella*, on the other, which is distinguished by its habit, entire leaves, and much longer style.

3 Spec. 1. *H. petræa* R. BR., *loc. cit.*—GREN. & GODR., *Fl. de Fr.*, i. 148.—WALP., *Ann.*, vii. 170.—*Lepidium petræum* L., *Spec.*, 899.

4 In *Linnæa*, i. 33, t. 2.—ENDL., *Gen.*, n. 4981.—B. H., *Gen.*, 92, n. 119.

5 "Flowers white."

6 A genus in gynæceum allied to *Hutchinsia*. Its true place is doubtful, owing to ripe seed and embryo being unknown.

7 Spec. 1. *R. sophiæfolia* CHAM. & SCHLTL., *loc. cit.*—WALP., *Rep.*, i. 192.

8 *Pl. Fendl.*, 116, not.; in *Torr. Emory's Rep.*, 34.—B. H., *Gen.*, 93, n. 123.

9 "Pink."

10 Spec. 1? *S. Berlandieri* A. GRAY, *loc. cit.*—WALP., *Ann.*, ii. 40; vii. 171.

11 In *Hook. Journ.*, iv. 76, t. 4.—B. H., *Gen.*, 93, n. 122.

at base. Petals long-unguiculate; blades twisted. Stamens 6; glands small alternating. Siliqua panduriform, much laterally-compressed; apex 2-lobed; valves flat-acute, undulate at edge; style very short, 2-lobed corrugated. Seeds ∞, suborbicular; funicles long free.—A branching perennial herb, stellate pubescent branches slender leafy; leaves runcinate-pinnatifid; inferior petiolate; superior (smaller) sessile; racemes terminal, ebracteate (*California*[1]).

135. **Biscutella** L.[2]—Sepals equal (*Thlaspidium*[3]), or lateral saccate or spurred at base. Stamens 6; lateral glands 4, sometimes descending in pairs to spurred sepals, elongated or horned (*Jondraba*[4]). Siliqua 2-dymous, compressed; valves orbicular compressed-keeled; septum narrow; style elongated or more rarely short (*Dithyrea*[5]); apex capitate. Seeds solitary in each cell, immarginate; radicle of compressed embryo accumbent descending. — Erect herbs, often hispid branching; leaves entire or pinnatifid; flowers[6] shortly racemose, ebracteate[7] (*Mediterranean, California*[8]).

136. **Brossardia** Boiss.[9]—All sepals or lateral only saccate at base. Petals tapering at base, sometimes subspathulate. Stamens free. Siliqua slowly or hardly dehiscent, broadly orbiculate or subelliptical, much compressed submembranous, entire at base and apex; style subulate; apex capitate stigmatose apiculate; septum linear; cells 1–3-seeded; valves very broadly winged papyraceous net-veined. Seeds orbiculate much compressed; funicles free, inserted at middle of cell.—A perennial glaucous herb; stem stupose at base, frutescent fistular; leaves ovate entire obtuse; cauline cordate amplexicaul; flowers[10] racemose (*Persia*[11]).

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1 Spec. 1. *L. Coulteri* Harv., *loc. cit.*—Walp., *Rep.*, v. 38.

2 *Gen.*, n. 808.—J., *Gen.*, 239.—DC., *Prodr.*, i. 181.—Spach, *Suit. à Buffon*, vi. 568.—Endl., *Gen.*, n. 4889.—B. H., *Gen.*, 91, n. 112.

3 DC., *Syst.*, ii. 409 (nec Spach).

4 Webb, *Phyt. Canar.*, i. 193.

5 In *Hook. Journ.*, iv. 77, t. 5. (The two Californian species are in some degree allied to *Lyrocarpa*, but, as regard fruit and structure of seed, similar to *Biscutella* proper.

6 Yellow.

7 2 sections according to DC.: 1. *Thlaspidium.* Sepals equal at base; lateral glands short. 2. *Jondraba.* Sepals broad, saccate or spurred at base; lateral glands horned.

8 As many as 20 species, according to authors, but probably about 5. Reichb., *Ic. Fl. Germ.*, ii. t. 8.—Boiss., *Fl. Or.*, i. 321.—Gren. & Godr., *Fl. de Fr.*, i. 134.—Walp., *Rep.*, i. 157; v. 38 (*Dithyrea*); *Ann.*, iii. 821; iv. 203; vii. 163.

9 In *Ann. Sc. Nat.*, sér. 2, xvii. 183.—B. H., *Gen.*, 91, n. 115.

10 White or pink.

11 Spec. 1. *B. papyracea* Boiss., *loc. cit.*; *Fl. Or.*, i. 335.—Walp., *Ann.*, ii. 45.

137. **Heldreichia** Boiss.[1]—Sepals equal at base. Larger stamens alate dilated at base or possessing a tooth. Siliqua 2-dymous or obovate, sometimes transversely oblong, compressed; style short; apex frequently emarginate; valves acutely keeled; septum narrow linear thin. Seeds descending strongly compressed immarginate; cotyledons accumbent.—Herbs, sometimes suffrutescent at base, often dichotomously branching;[2] leaves subradical petiolate ovate, cordate or pinnatisect; flowers[3] in elongated or short corymbiform, sometimes subumbelliform, ebracteate racemes (*East*[4]).

138. **Megacarpæa** DC.[5]—Sepals equal. Stamens 6, or more rarely ∞, free toothless. Siliqua large, 2-dymous, much laterally compressed; valves orbiculate, broadly alate, closed; stigma subsessile. Seeds solitary in each cell, large much compressed immarginate; radicle of much compressed embryo accumbent, obliquely descending or transversely superior.—Perennial large robust branching herbs; root thick long-conical; leaves (glaucous) pinnatisect; flowers[6] in simple or branching corymbiform racemes (*Himalaya, Tibet, Siberia*[7]).

139. **Cremolobus** DC.[8]—Flowers nearly of *Biscutella*. Siliqua stipitate, 2-dymous, 2-scutate, dehiscent; valves (nearly of *Biscutella*) compressed-keeled or winged at base, narrow closed; stipe free hardened, more or less thickened at base. Seeds descending immarginate.—Herbs or undershrubs erect or subscandent (?), glabrous or pubescent; leaves opposite or alternate, entire or pinnatifid; flowers[9] ebracteate, in terminal, usually branching racemes (*Columbia, Andine Peru*[10]).

140. **Didymophysa** Boiss.[11]—Sepals equal at base, suberect.

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[1] In *Ann. Sc. Nat.*, sér. 2, xvi. 381.—B. H., *Gen.*, 91, n. 113.—*Zygopellis* Fenzl., *Enum. Pl. Syr. ined.* (ex Endl., *Gen.*, Suppl., iii. 87).

[2] With aspect of several *Umbelliferæ*, e.g., of *Hydrocotyleæ*.

[3] White or pink, small.

[4] Spec. 4. Boiss., in *Tchihatch. As. Min.*, *Bot.*, i. 327; *Fl. Or.*, i. 319.—Russegg., *Reis.*, t. 15.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 176.—Walp., *Rep.*, i. 158; *Ann.*, vii. 165.

[5] *Syst. Veg.*, ii. 417; *Prodr.*, i. 183.—Endl., *Gen.*, n. 4891.—Hook. f. in *Journ. Linn. Soc.*, v. 176.—B. H., *Gen.*, 91, n. 114.

[6] White or violet.

[7] Spec. 3. Ledeb., *Ic. Fl. Ross.*, t. 372, 380.—Hook., *Journ.*, vii. t. 7.—Walp., *Ann.* iv. 207.

[8] *Syst. Veg.*, ii. 418; *Prodr.*, i. 184.—Endl., *Gen.*, n. 4892.—B. H., *Gen.*, 90, n. 110.

[9] White or yellow.

[10] Spec. about 5. Hook., *Icon.*, t. 32, 81, 99, 100.—Walp., *Rep.*, i. 148; *Ann.*, vii. 163.

[11] In *Ann. Sc. Nat.*, sér. 2, xvii. 179.—B. H., *Gen.*. 91, n. 111.

Stamens inserted on scarcely glandular receptacle. Siliqua 2-dymous vesicular, style erect; apex stigmatose capitate; valves globose inflated reticulate, 1, 2-seeded; septum linear membranous. Seeds descending immarginate; funicles short free.—A perennial herb,[1] cæspitose low glabrous (subglaucous); suckers creeping; leaves alternate slightly fleshy, 3- or palmatifid; flowers[2] in racemes (sometimes subcorymbose); pedicles slender, ebracteate (*Mountainous Persia*[3]).

b. LEPIDINEÆ.—*Cotyledons usually incumbent.*

141. **Lepidium** L.[4]—Sepals equal at base. Petals small, sometime 0. Stamens 6, or 2–4 deficient or deformed. Siliqua ovate obovate obcordate or oblong, more rarely subglobose, frequently much laterally compressed keeled, apex emarginate winged or wingless; style slender or nearly absent; apex stigmatose emarginate, valves of very variable form; septum narrow membranous.—Seeds 1, 2 in each cell, inserted below apex, descending (micropyle extrorse superior) compressed or sub-3-quetrous immarginate; cotyledons of rather fleshy embryo incumbent, or more rarely accumbent, sometimes tripartite; funicles free.—Undershrubs or more frequently herbs, glabrous or downy, varying in habit, simple or branching, rigid or tender; leaves varying; flowers[5] ebracteate, in more or less elongated racemes[6] (*All Temperate and warm regions*[7]).

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[1] Habit of *Coluteocarpus*; a plant related to *Alyssineæ*.

[2] White.

[3] Spec. 1. *D. Aucheri* BOISS., *loc. cit.*; *Fl. Or.*, i. 318.

[4] *Gen.*, n. 801.—J., *Gen.*, 241.—DC., *Prodr.*, i. 203.—SPACH, *Suit. à Buffon*, vi. 548.—ENDL., *Gen.*, n. 4932.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, v. 173.—A. GRAY, *Gen. Ill.*, t. 73.—B. H., *Gen.*, 87, 967, n. 94.—*Manoploga* BGE., in *Pl. Preiss.*, i. 259.

[5] Small or very small, white, more rarely yellow.

[6] "The following sections laid down by DE CANDOLLE (ex B. H., *loc. cit.*) are for the most part good: 1. *Cardaria* (DC.). Siliqua ovate-cordate acute; valves wingless; style filiform. (*Cardaria* DESVX., *Journ. Bot.*, iii. 163.—REICHB., *Ic. Fl. Germ.*, ii. t. 9.)—2. *Ellipsaria* (DC.). Siliqua elliptical; valves keeled wingless; style filiform. (DESF., *Fl. Atl.*, t. 147.)—3. *Bradypiptum* (DC.). Siliqua elliptical; valves keeled wingless; style short. (LEDEB., *Ic. Fl. Ross.*, t. 162.)—4. *Cardamon* (DC.). Siliqua suborbiculate; valves subalate; style short; cotyledons tripartite. (REICHB., *loc. cit.*, t. 9.—*Thlaspidium* SPACH, *Suit. à Buffon*, vi. 557.)—5. *Lepia* (DC.). Siliqua suborbiculate emarginate; valves apiculate winged; wings often adnate to very short style. (REICHB., *loc. cit.*, t. 9.—WEDD., *Chl. Andina*, t. 86 C.—*Lepia* DESVX., *Journ. Bot.*, iii. 168.)—6. *Dileptium* (DC.). Siliqua subelliptical; valves keeled wingless; stigma sessile; flowers sometimes 2–4-androus. (REICHB., *loc. cit.*, t. 10.—LEDEB., *Ic. Fl. Ross.*, t. 92.—*Cynocardamum* WEBB, *Phyt. Canar.*, i. 96.)—7. *Lepidiastrum* (DC.). Siliqua ovate or elliptical quite entire; valves keeled wingless; stigma sessile. (REICHB., *loc. cit.*, t. 10.—DELESS., *Ic. Sel.*, ii. t. 73.)"—8 (?). *Physolepidium* (SCHRENK, *Enum.*, 97.—WALP., *Rep.*, ii. 762). Siliqua inflated; cells 2-seeded or by abortion 1-seeded; valves wingless.

[7] Spec. about 60–80. BOISS., *Fl. Or.*, i. 353.—

142. **Hymenophysa** C. A. MEY.[1]—Sepals short, equal at base. Siliqua small inflated globose, few seeded; style slender, more or less elongated, erect; apex stigmatose capitellate; valves boat-shaped, obtuse at back wingless; septum membranous, entire or fenestrate. Seeds descending immarginate; funicle setaceous free.—Perennial branching herbs; branches leafy; flowers[2] in corymbose racemes; pedicels slender, ebracteate[3] (*Persia, Altai*[4]).

143. **Brachycarpæa** DC.[5]—Sepals erect, at base rather broad erect. Petals much elongated. Siliqua 2-dymous, 2-celled, indehiscent, valves ventricose, emarginate or subcristate. Seeds in cells solitary descending subglobose; micropyle extrorse superior; funicle short; cotyledons of rather fleshy embryo spirally convolute.—Glabrous virgate undershrubs; leaves sessile linear entire; flowers[6] in elongated racemes; pedicels rather long ebracteate (*Cape of Good Hope*[7]).

144? **Physalidium** FENZL.[8]—Sepals patulous, equal at base. Petals broadly obovate orbiculate, shortly unguiculate. Filaments toothless subequal subulate, rather tumid at very base. Siliqua (unripe) elliptical-oblong, laterally compressed, 2-celled; cell 1, 2-ovulate in middle, style filiform; stigma emarginate. Seeds (unripe) oblong, suspended from very thin free funicles.—A herb;[9] rhizome short woody; collar thickly crowned with suberous remains of petioles; stems slender, suberect at apex sparingly branching naked; leaves long-petiolate reniform-rotundate, largely lobulate-crenate; flowers[10] subcymose; pedicels long slender filiform, ebracteate[11] (*Northern Persia*[12]).

BENTH., *Fl. Austral.*, i. 83. — HOOK. F., *Hand. N.-Zeal. Fl.*, 13.—GRISEB., *Fl. Brit. W. Ind.*, 14. — EICHL., in *Mart. Fl. Bras.*, *Crucif.*, 309.—GREN. & GODR., *Fl. de Fr.*, i. 149.—WALP., *Rep.*, i. 176; ii. 762; v. 42; *Ann.*, i. 44; ii. 50; iii. 822; iv. 213.

[1] In *Ledeb. Fl. Alt.*, iii. 180; *Ic. Fl. Ross.*, t. 165.—ENDL., *Gen.*, n. 4933.—B. H., *Gen.*, 88, n. 95.

[2] White.

[3] Perhaps rather a section of *Lepidium* (?).

[4] BOISS., *Fl. Or.*, i. 362.—WALP., *Rep.*, i. 179.

[5] *Syst. Veg.*, ii. 698; *Prodr.*, i. 236.—ENDL., *Gen.*, n. 4976.—B. H., *Gen.*, 87, n. 93.

[6] Large, yellow or purple.

[7] Spec. 2. DELESS., *Ic. Sel.*, ii. t. 100.—HARV. & SOND., *Fl. Cap.*, i. 33.

[8] In *Tchihatch. As. Min.*, *Bot.*, i. 327.—B. H., *Gen.*, 88, n. 97.

[9] "Habit of *Saxifraga granulata*; leaves inflorescence and flowers wonderfully like those of *Grællsia*.

[10] "White."

[11] "A genus without doubt very closely allied to *Grællsia*, differing in suppression of ovules and contrary compression of siliqua."

[12] Spec. 1. *P. stylosum* BOISS. & HOHEN., *Diagn. Or.*, ser. 1, viii. 4.—FENZL., *loc. cit.*—BOISS., *Fl. Or.*, i. 318.

145. **Stroganovia** KAR. & KIR.[1]—Flowers of *Lepidium*. Siliqua ellipsoid or obovoid, shortly stipitate, obtuse turgid; valves boat-shaped, 1-ribbed; septum entire, rather thick, transversely rugose or undulate; style short; apex stigmatose capitate. Seeds solitary in each cell, large, filling cells, descending, externally convex, internally flat; cotyledons unequal nearly flat, or sometimes both concave on inside; radicle rather short incumbent, more or less oblique, or accumbent.—A tall perennial herb; root thick; stem robust; leaves alternate; flowers[2] ebracteate in branching, terminal and axillary racemes; pedicels slender, ebracteate[3] (*Songaria*[4]).

146. **Coronopus** HALL.[5]—Sepals short, either subequal at base, or lateral subsaccate. Petals small or more or less abortive. Stamens free toothless, 6, or 4 (smaller abortive or 0). Glands 2, antero-posterior, usually narrow linear. Siliqua small, 2-dymous, laterally compressed; valves subglobose or rather compressed, rugose or crested; stigma sessile subspherical. Seeds 1 in each cell, descending; micropyle extrorse superior; albumen scanty or 0; cotyledons incumbent or induplicate, continuous at tapering base with narrowly conical radicle.—Annual or biennial herbs branching from collar, diffuse; leaves alternate, entire or pinnatisect; flowers[6] in short leaf-opposed racemes (*Temperate and warm regions of both Hemispheres*[7]).

147. **Ionopsidium** REICHB.[8]—Perianth and stamens nearly of *Cochlearia*. Siliqua oblong-elliptical or broadly oblong, compressed, obtuse at both ends; valves subcarinate membranous wingless;

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[1] In *Bull. Mosc.* (1841), 386; (1842), 535.—B. H., *Gen.*, 88, n. 96.—FOURN., in *Bull. Soc. Bot. de Fr.*, ix. 535.

[2] White.

[3] A genus with siliqua analogous to that of *Camelina* and *Lepidium*.

[4] Spec. 1 (or 3, 4?). WALP., *Rep.*, ii. 763; v. 50; *Ann.*, vii. 159.

[5] *Helv.*, i. 217 (nec T.)—GÆRTN., *Fruct.*, ii. 293, t. 242.—LAMK., *Ill.*, t. 558.—*Senebiera* DC., in *Mém. Soc. Hist. Nat. Par.*, ann. 7, 140, t. 89; *Prodr.*, i. 202.—POIR., *Dict.*, vii. 75; Suppl., v. 128.—SPACH, *Suit. à Buffon*, vi. 577.—ENDL., *Gen.*, n. 4975.—B. H., *Gen.*, 87, 967, n. 92.—*Nasturtiolum* MEDIK., *Gen.*, 82, t. 2, fig. 21.—*Carara* CÆSALP., *Pl.*, 370.—*Coty-liscus* DESVX., *Journ. Bot.*, iii. 164, 175, t. 25, fig. 13.

[6] White, more rarely purple, very small.

[7] Spec. about 6. REICHB., *Ic. Fl. Germ.*, ii. t. 9.—HARV. & SOND., *Fl. Cap.*, i. 27.—BENTH., *Fl. Austral.*, i. 82.—BOISS., *Fl. Or.*, i. 362.—EICHL., in *Mart. Fl. Bras.*, *Crucif.*, 307, t. 66.—GRISEB., *Fl. Brit. W. Ind.*, 14.—GREN. & GODR., *Fl. de Fr.*, i. 153 (*Senebiera*).—WALP., *Rep.*, i. 190; ii. 764; v. 50; *Ann.*, i. 50; iv. 222; vii. 156.

[8] *Pl. Crit.*, vii. 26, t. 649.—DC., *Prodr.*, i. 174.—B. H., *Gen.*, 86, n. 91.

septum narrow oblong very thin; style short; apex slightly capitate stigmatose, 2-lobed. Seeds few suborbiculate rather compressed, glandular tuberculate or echinulate; funicles free or adnate to septum at base; radicle cylindrical incumbent.—Rather small annual glabrous herbs, one branching from base (*Pastorea*[1]); the other scapigerous, 1-flowered; leaves sessile or petiolate, spathulate, entire or 3-lobed; flowers[2] either racemose (*Pastorea*) bracteate, or solitary (*Euionopsidium*) ebracteate (*Portugal, Sicily, Northern Africa*[3]).

148. **Noccæa** REICHB.[4]—Sepals patulous, equal or slightly unequal at base. Petals entire, contracted at base. Stamens 6, toothless. Siliqua elliptical or obovate-oblong; style short erect, apex stigmatose capitellate; valves boat-shaped slightly compressed, not keeled, usually 2-seeded. Seeds oblong; funicles free; cotyledons incumbent.—Rather small herbs; leaves crowded; radical pinnatisect; flowers[5] subcorymbose at top of scape, ebracteate (*Alpine Europe*[6]).

149. **Capsella** MOENCH.[7]—Sepals equal at base, afterwards patulous. Petals much narrowed at base, rather short. Stamens 6, free. Carpellary glands 4, interior to lesser stamens, more or less coalescent in pairs. Siliqua obcuneate or elliptical-oblong, compressed or subterete; valves much compressed, boat-shaped or triangular, keeled; septum narrow membranous; style short erect; apex stigmatose minutely capitate. Seeds ∞, wingless; funicles free; embryo fleshy; cotyledons incumbent or more rarely accumbent.—Annual herbs, often weak, glabrous or pilose; stem branching; radical leaves rosulate, entire or lobed; cauline subentire, sometimes sagittate at base; flowers[8] racemose; pedicles slender, ebracteate[9] (*Temperate regions of both Hemispheres*[10]).

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[1] TODAR., *Pl. Sic.*, in *Bert. Fl. Ital.*, x. 520; *Nuov. Gen. et Spec.*, fasc. i. 17.

[2] White flesh-coloured or violet, small.

[3] COSS. & DUR., *Fl. Alger.*, t. 72.—WALP., *Rep.*, i. 175; *Ann.*, i. 44; vii. 155.

[4] *Ic. Fl. Germ.*, 633, ii. t. 11 (nec. JACQ.).—ENDL., *Gen.*, n. 2273 a.—B. H., *Gen.*, 86, n. 90.

[5] White, small.

[6] Spec. 2. DC., *Prodr.*, i. 177.—GREN. & GODR., *Fl. de Fr.*, i. 147 (*Hutchinsia*).

[7] Ex VENT., *Tabl.*, iii. 110.—DC., *Syst.*, ii. 383; *Prodr.*, i. 177.—SPACH, *Suit. à Buffon*, vi. 536.—ENDL., *Gen.*, n. 4927.—B. H., *Gen.*, 86, 967, n. 88.—*Hymenolobus* NUTT. (ex WALP., *Ann.*, iv. 212).—*Microlepidium* F. MUELL., in *Linnæa*, xxv. 371.

[8] Small, white.

[9] A genus ill defined in limits, leaning on one side to *Hutchinsia*, on the other to *Smelowskia*.

[10] Spec. 5, 6. REICHB., *Ic. Fl. Germ.*, ii. t.

150. **Mancoa** WEDD.[1]—Sepals equal at base, persistent. Petals entire, sometimes subspathulate, long-tapering at base.* Stamens toothless. Siliqua long elliptical or oblong, laterally compressed, indehiscent; style erect short; apex stigmatose slightly thickened; valves boat-shaped, obscurely venose, obtuse behind; septum narrowly oblong membranous. Seeds ∞, 2-seriate beside septum; embryo coloured; cotyledons incumbent.—An annual herb, very small spreading-prostrate very much branched, more or less stellately hispid; leaves lyrate or broadly sinuate-pinnatifid; flowers[2] in short terminal racemes (*Andine Peru*[3]).

151? **Notothlaspi** HOOK. F.[4]—"Sepals suberect, equal at base. Petals spathulate. Stamens toothless free. Siliqua[5] sessile, oblong or obcuneate, much compressed, ∞-seeded; valves winged at back and apex; septum narrowly elliptical membranous; style robust; stigma capitate or emarginate. Seeds very numerous, very small, reniform; funicles capillary elongated horizontal; cotyledons incumbent.—A rather small fleshy herb; root perennial; stem short simple, naked or leafy; leaves crowded; radical rosulate, oblong or obovate, spathulate crenulate; flowers[6] subcorymbose; pedicels elongate axillary or leafy, bracteate, sometimes racemose[7] (*New Irlandia*[8]).

152. **Schouwia** DC.[9]—Sepals erect; lateral broader, more or less saccate at base.[10] Petals unguiculate. Stamens 6, free 4-dynamous. Hypogynous glands 4; septal 2, long subulate. Siliqua thick stipitate large, oblong subelliptical or cordate, much plano-compressed, emarginate; style elongated subconical; apex stigmatose capitate emarginate; septum linear ribless membranous; valves quite flat,

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11.—WEDD., *Chlor. Andina*, i. t. 86 B (*Hutchinsia*).—GRISEB., *Fl. Brit. W. Ind.*, 14.—EICHL., in *Mart. Fl. Bras.*, *Crucif.*, 307.—BOISS., *Fl. Or.*, i. 340.—BENTH., *Fl. Hongk.*, 16; *Fl. Austral.*, i. 81.—GREN. & GODR., *Fl. de Fr.*, i. 147 (*Thlaspi*).—WALP., *Rep.*, i. 175; ii. 761; *Ann.*, vii. 155.

1 *Chlor. Andina*, i. t. 86 D.—B. H., *Gen.*, 86, n. 89.

2 White.

3 Spec. 1. *M. hispida* WEDD., *loc. cit.*

4 *Gen.*, 90, 967, n. 106.

5 "Rather large, recalling that of *Thlaspi arvensis*."

6 "White."

7 "A very distinct genus, owing to its very numerous seed and capillary funicles."

8 Spec. 2. HOOK., *Icon.*, t. 848 (*Thlaspi ?*).—HOOK. F., *Fl. Nov.-Zel.*, ii. 325; *Handb. N.-Zeal. Fl.*, 14.

9 *Syst. Veg.*, ii. 643; *Prodr.*, i. 224 (nec SCHRAD.).—ENDL., *Gen.*, n. 4962.—B. H., *Gen.*, 89, n. 104.—*Cyclopterygium* HOCHST., in *Flora* (1848), 175, not.

10 Sacs larger in *Cyclopterygium*.

chartaceous or membranous, reticulate, broadly alate.—Seeds ∞, 2-seriate; funicles free; transverse or descending; testa (mucous) immarginate; cotyledons conduplicate.—Annual branching glabrous herbs; leaves alternate entire; superior auriculate-amplexicaul; flowers[1] in racemes at first short corymbiform, afterwards elongated; pedicels slender, usually short (*Arabia*[2]).

153. **Psychine** Desf.[3]—Sepals elongated erect; lateral hardly saccate at base. Petals long-unguiculate. Stamens toothless. Siliqua large, broadly obcordate or obcuneate-2-lobed; septum complete narrow hyaline; valves turgid at base, broadly winged above, boat-shaped coriaceous, separating scarcely or not at all; style long-subulate, at base sub-4-gonous, afterwards hardened; apex stigmatose capitate emarginate. Seeds ∞, small, subglobose or shortly ovoid, sometimes hardly compressed, glabrous; embryo thick; cotyledons conduplicate.—An annual branching hispid herb; leaves obovate; radical petiolate; cauline sessile dentate, auriculate at base; flowers[4] in elongated racemes; bracts foliaceous; pedicels slender (*North Africa*[5]).

154. **Dilophia** Thoms.[6]—Sepals patulous, equal at base, rather thick at apex, imbricate. Petals long-tapering at base. Siliqua short, shortly stipitate, broadly obcordate 2-dymous; style thick very short; apex stigmatose truncate; valves short, behind thickly 2-cristate; septum broadly fenestrate, afterwards disappearing; replum broad, saccate on both sides at base. Seeds 1–4 in each cell, unequally oblong immarginate; funicles rather thick; radicle incumbent or obliquely accumbent.—A depressed glabrous rather fleshy herb; root perennial elongated; collar multiple; leaves densely rosulate, unequally spathulate obovate or linear, entire or sinuate-dentate; flowers crowded in branching contracted umbelliform racemes, dense and leafy at base (*Tibet*[7]).

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[1] Rather large, purple.

[2] Spec. 2, 3. Hook., *Icon.*, t. 223.—Jaub. & Spach, *Ill. Pl. Or.*, t. 296, 297.—Boiss., *Fl. Or.*, i. 398.—Walp., *Ann.*, ii. 54.

[3] *Fl. Atl.*, ii. 69, t. 148.—DC., *Prodr.*, 224.—Endl., *Gen.*, n. 4963.—B. H., *Gen.*, 89, n. 105.

[4] Nearly of *Brassica* or *Matthiola*, rather large; petals white, with blackish veins.

[5] Spec. 1. *P. stylosa* Desf., *loc. cit.*—Reg., *Ind. Sem. Hort. Petrop.* (1857).—Walp., *Ann.*, vii. 162.

[6] In *Hook. Journ.*, iv. t. 12; v. 19.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, v. 175.—B. H., *Gen.*, 89, n. 102.

[7] In salt marshes. Spec. 1. *D. salsa* Thoms., *loc. cit.*

155? **Stubendorfia** SCHRENK.[1]—Flowers...? Siliqua obovate or obcordate compressed, 2-celled, scarcely dehiscent; valves boat-shaped membranous-winged veined; septum narrow membranous; style very short. Seed in one cell abortive: in the other descending; funicle short; cotyledons long-tapering at base, incumbent.—A tall herb;[2] root thick perennial; leaves spathulate; flowers in a large much branching raceme; fruiting pedicels pendulous (*Songaria*[3]).

156. **Eunomia** DC.[4]—Flowers nearly of *Æthionema*. Stamens 6, toothless. Siliqua elliptical flat-compressed; valves compressed-keeled, winged at apex; septum elongated membranous; style short; apex stigmatose capitate, 2-lobed. Seeds 1, 2 in each cell; funicles more or less adnate to septum at base.—Shrubs or subcæspitose herbs; leaves opposite, sessile or amplexicaul, entire; flowers[5] in sometimes corymbiform racemes (*Asia Minor*[6]).

157. **Æthionema** R. BR.[7]—Sepals subunequal; lateral sometimes subsaccate at base. Stamens 6; larger either connate, or dilated outside at base, with an internal tooth below apex. Glands hardly conspicuous. Siliqua cymbiform or cochleate; valves broadly winged, with sometimes dentate wings, boat-shaped at middle; septum membranous; style short; apex stigmatose capitate, sub-entire or 2-lobed. Seeds ∞, or more rarely few, immarginate; funicles free.—Herbs or undershrubs; stem terete; branches thin; leaves generally glabrous glaucous, articulated at base, subsessile; inferior sometimes opposite; flowers[8] racemose crowded; pedicels articulate at base, ebracteate, slender (*South Europe, Asia Minor, Persia*[9]).

158. **Bivonea** DC.[10]—Flowers nearly of *Lepidium*; sepals sub-

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[1] In *Linnæa*, xviii. 218.—B. H., *Gen.*, 89, n. 103.

[2] Aspect of *Isatis*; stem robust glabrous.

[3] Spec. 1. *S. orientalis* SCHRENCK, *loc. cit.*—WALP., *Rep.*, v. 50.

[4] *Syst. Veg.*, ii. 555; *Prodr.*, i. 208.—ENDL., *Gen.*, n. 4930.—B. H., *Gen.*, 89, n. 101.

[5] Small, white.

[6] Spec. about 2. JAUB. & SPACH, *Ill. Pl. Or.*, t. 51.—BOISS., *Fl. Or.*, i. 344 (*Æthionema*).—WALP., *Rep.*, i. 175; v. 41; *Ann.*, ii. 50; iii. 212; vii. 155.

[7] In *Ait. Hort. Kew.*, ed. 2, iv. 80.—DC., *Prodr.*, i. 208.—ENDL., *Gen.*, n. 4934.—B. H., *Gen.*, 88, n. 99.—*Diastrophis* FISCH. & MEY., *Ind. Sem. Hort. Petrop.*, 35 (ex BGE.).

[8] Purple, pink, or flesh-coloured.

[9] Spec. about 15. DELESS., *Ic. Sel.*, ii. t. 74, 75.—REICHB., *Ic. Fl. Germ.*, ii. t. 11.—BOISS., *Fl. Or.*, i. 341.—GREN. & GODR., *Fl. de Fr.*, i. 142.—WALP., *Ann.*, i. 44; ii. 51.

[10] *Syst. Veg.*, ii. 554; *Prodr.*, i. 208.—ENDL., *Gen.*, n. 4929.—B. H., *Gen.*, 88, n. 98 (nec MOÇ., nec RAFIN.).

equal at base. Siliqua elliptical or subovoid, emarginate, laterally much compressed; style very short; apex stigmatose minutely capitate; valves keeled subalate; septum oblong membranous. Seeds few (2–6) in each cell, ovate immarginate; funicles slender, adnate to septum at base.—An annual herb, rather thin glabrous glaucescent; inferior leaves petiolate; cauline cordate-amplexicaul; flowers[1] in finally elongated racemes; pedicels slender, ebracteate (*Sicily*[2]).

159. **Campyloptera** Boiss.[3]—Sepals nearly erect; lateral gibbous at base. Larger stamens dilated or connate at base. Siliqua dimorphous cymbiform; edges incurved unequally winged; some 1-celled, 1-seeded; others 2-celled. Seeds 1, 2 in each cell, descending; funicles free.—A branching glabrous herb;[4] lower leaves opposite sessile amplexicaul entire; flowers[5] in terminal racemes (*Syria*[6]).

160. **Menonvillea** DC.[7]—Sepals scarcely dissimilar; lateral subsaccate at base. Siliqua substipitate dorsally compressed, 2-scutate; valves convex at back; sides broadly winged. Seeds solitary in each cell; cotyledons incumbent.—Erect herbs or undershrubs, glabrous; leaves linear; radical more or less dentate; cauline entire; flowers[8] ebracteate in frequently elongated racemes, simple or sparingly branching (*Peru, Chili*[9]).

161. **Hexaptera** Hook.[10]—Sepals uniform subequal. Petals contracted at base. Stamens 6; longer 4 connate in pairs or free. Siliqua inserted in unthickened receptacle, shortly stipitate dorsally compressed, 6-winged; style cylindrical; apex stigmatose capitate; valves much contracted at suture, 3-winged; dorsal wing 1; lateral

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[1] Small, yellow.

[2] Spec. 1. *B. lutea* DC., *loc. cit.*

[3] In *Ann. Sc. Nat.*, ser. 2, xvii. 194.—B. H., *Gen.*, 89, n. 100.

[4] Habit of *Tauscheria.*

[5] White.

[6] Spec. 1. *C. heterocarpa.*—*C. syriaca* Boiss., *Fl. Or.*, i. 353. — *Æthionema heterocarpum* Fisch. & Mey.—*Æ. Buxbaumii* DC., *Syst.*, ii. 561; *Prodr.*, i. 209, n. 4.

[7] *Syst. Veg.*, ii. 419; *Prodr.*, i. 184.—Endl., *Gen.*, n. 4893.—B. H., *Gen.*, 90, n. 108.—? *Dispeltophorus* Lehm., *Ind. Sem. Hort. Hamb.* (1836), n. 2.—*Cymatoptera* Turcz., in *Bull. Mosc.* (1854), ii. 209.

[8] "White or dirty-tawny."

[9] Spec. 4. Deless., *Ic. Sel.*, ii. t. 56.—Presl, *Bot. Bem.*, 9.—Barn., in *C. Gay Fl. Chil.*, i. 181.—Walp., *Rep.*, i. 159; *Ann.*, i. 38; vii. 162.

[10] *Bot. Misc.*, i. 350, t. 72–74.—Endl., *Gen.*, n. 4935.—B. H., *Gen.*, 90, n. 107.

wings 2; septum very narrow. Seeds solitary in each cell, immarginate; cotyledons flat.—Undershrubs or herbs, simple or cæspitose, pubescent; leaves radical and cauline, entire or pinnatifid spathulate; flowers[1] racemose, ebracteate (*Chili*[2]).

162 (?) **Decaptera** TURCZ.[3]—"Sepals equal at base. Stamens free. Siliqua (compressed dorsally ?) 2-celled; cells 1-seeded, indehiscent, pendulous from apex of style, flat along commissure, 5-winged behind;[4] style short; stigma globose.[5] Seeds pendulous; cotyledons flat.—A low perennial many-stemmed villous herb; leaves distantly scattered, petiolate cuneate, 3-fid; racemes terminal many-flowered" (*Chili*[6]).

VII. SUBULARIEÆ.

163. **Subularia** L.—Receptacle cupuliform; lobes of disk 4, truncate at apex, superposed to petals. Sepals patulous perigynous. Petals sessile, afterwards elongated. Stamens 6, perigynous free toothless, slightly 4-dynamous. Siliqua inserted in bottom of receptacle, subsessile, elliptical or subglobose, sometimes oblong, rather turgid; style nearly absent; stigma very short simple; valves convex ribbed; septum membranous. Seeds few, 2-seriate, descending, immarginate; embryo incurved; cotyledons narrow incumbent, continuous with radicle.—Annual rather small herbs, aquatic or, submerged, glabrous; leaves subradical elongated-subulate; flowers small laxly racemose (?) at top of scape, ebracteate (*Europe, Asia, and North America, Mountainous Abyssinia*). See p. 208.

[1] White.

[2] Spec. about 6. BARN., in *C. Gay Fl. Chil.*, i. 175.—WEDD., *Chl. Andina*, t. 86 f.—WALP., *Rep.*, i. 180; *Ann.*, i. 45; vii. 162.

[3] In *Bull. Mosc.* xix. 497 (whence our description).—B. H., *Gen.*, 90, n. 109.

[4] "Valves recalling in form the mericarps of many *Umbelliferæ*." (TURCZ., *loc. cit.*)

[5] "Fruit-cells affixed to persistent axis formed from style by thin threads, soon caducous."

[6] Spec. 1. *D. trifida* TURCZ., *loc. cit.*—WALP., *Ann.*, i. 45.

XIX. RESEDACEÆ.

I. ASTROCARPUS SERIES.

This small group was formerly restricted to the members of the *Reseda* (figs. 311, 320—329). One of these, formerly named *R. canescens*,[1] is easily distinguished from all the rest by its free carpels; it has been made the type of the genus *Astrocarpus*.[2] Its flowers (figs. 312–317) are irregular and hermaphrodite. On the concave receptacle are inserted five or six unequal sepals, the smallest posterior and the largest anterior, covering the lateral ones in præfloration. The petals, five in number alternating with the sepals, are formed, as we shall see, like those of *Reseda;* they form a sort of scale at the base, on the back of which are inserted petaloid blades, which differ on the different petals. The more posterior the petal the larger and the more dissected are the blades, so that that of the anterior sepal may be simple, the lateral ones tri- or quadrifid, and the posterior ones divided into yet deeper and more dissected

Reseda lutea.

FIG. 311.
Flowering tip.[1]

[1] L., *Spec.*, 448.—*R. sesamoides* L., *Spec.*, 449.—*R. purpurascens* L., *Spec.*, 449.—*R. stellata* LAMK., *Fl. Fr.*, 204.—*Astrocarpus sesamoides* DUB., *Bot. Gall.*, i. 67.—REICHB., *Ic. Fl. Germ.*, ii. 22, t. 99.—J. MUELL., in *DC. Prodr.*, xvi. sect. ii. 552.—*A. Clusii* J. GAY, in *Schultz. Arch.* (1842), 33.—GREN. & GODR., *Fl. de Fr.*, i. 190.—*A. cochlearifolius* NYM., in *Vet. Akad. Fönh.* (1861), 191, t. 4.—*A. interruptus* BOR., *Trois Not. sur les Pl. de Corse* (1859), 3.—*Sesamella Tournefortii* REICHB., in *Flora* (1830), 130.

[2] NECK., *Elem.*, ii. (1700), 243.—SPACH, *Suit. à Buffon*, vii. 105.—ENDL., *Gen.*, n. 5013.

strips. We shall find all this in *Reseda*, of which *Astrocarpus* has the stamens too; there are from six to twenty of these, inserted at very

Astrocarpus canescens.

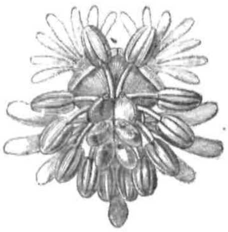

FIG. 312.
6-carpellate flower (6/1).

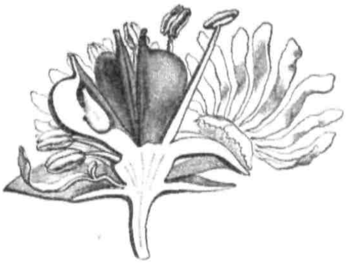

FIG. 314.
Long. sect. of flower (8/1).

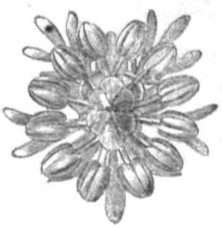

FIG. 315.
12-androus flower (6/1).

FIG. 316.
Long. sect. of 12-androus flower (6/1).

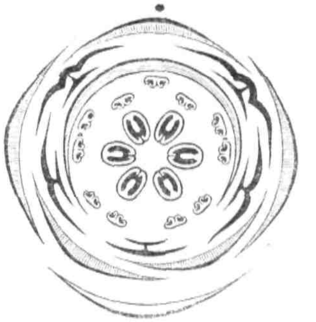

FIG. 313.
Diagram.

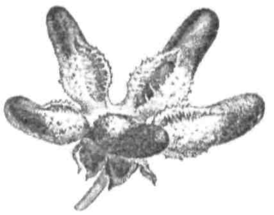

FIG. 317.
Fruit (5/1).

unequal heights on the receptacle, for behind they are raised on a sort of disk, formed like a thick glandular scale and greatly developed on that side. The free superior gynæceum is formed of as many carpels as there are petals (to which they are superposed), inserted on the prolonged summit of the receptacle. Each carpel has an ovary, gibbous above and behind, tapering above and ventrally into a short style, whose apex is stigmatiferous internally. In each carpel is a dorsal parietal placenta, usually bearing one descending campylotropous ovule, with its micropyle looking upwards and in-

—PAYER, *Organog.*, 199, t. 40.—J. MUELL., *Monogr. Resedac.*, 218, t. 10, fig. 130, 131; in *DC. Prodr.*, xvi. sect. ii. 552.—B. H., *Gen.*, 111, n. 1.—*Sesamoides* T., *Inst.*, 424, t. 238.—*Sesamella* REICHB., *Consp. Regn. Veg.*, n. 4823.

wards. Each carpel when ripe becomes a follicle, bearing outside a glandular gibbosity (fig. 317), and opens to free a recurved seed. The folded embryo is fleshy, exalbuminous. *A. canescens* appears to be the only species[1] of the genus; it is a perennial herb from the Mediterranean, ramifying from the base, and bearing alternate simple exstipulate leaves. Its flowers, each axillary to a bract, form racemes which may almost become spikes.

Astrocarpus canescens.

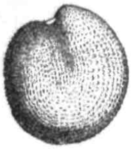

FIG. 318. Seed ($\frac{8}{1}$).

FIG. 319. Long. sect. of seed.

II. RESEDA SERIES.

The flowers of *Reseda*[2] (figs. 311, 320–329) are irregular and hermaphrodite, with a regular or oblique convex receptacle. The calyx, as in *Astrocarpus*, consists of an inconstant number of sepals, usually five or six, but varying from four to eight; they are equal or unequal, imbricated when very young, but early ceasing to touch by their edges. When there are five sepals, one is posterior, two lateral, and two anterior; the sixth when present is in front of these last; when there are only four sepals the posterior is absent. There are usually as many alternating petals as sepals; they are unequal and dissimilar. First they are larger as they are more posterior, and next their blade is here more dissected, and the basal membranous scale is better developed; it is even sometimes absent in the anterior

Reseda lutea.

FIG. 320. Flower ($\frac{6}{1}$).

FIG. 321. Flower without corolla.

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1 WALP., *Rep.*, ii. 754; *Ann.*, vii. 194.

2 *Reseda* T., *Inst.*, 423, t. 238.—L., *Gen.*, n. 608 (ed. 1, n. 447).—GÆRTN., *Fruct.*, i. 369, t. 76.—J., *Gen.*, 245. — LAMK., *Dict.*, vi. 157; Suppl., iv. 669; *Ill.*, t. 410.—TRIST., in *Ann. Mus.*, xviii. 392, t. 21.—SPACH, *Suit. à Buffon*, vii. 97. — ENDL., *Gen.*, n. 5011. — PAYER, *Organog.*, 193, t. 39; *Fam. Nat.*, 140.—M. ARG. (J. MUELL.), *Mon. Resedac.*, 96, t. 1-9; in *DC. Prodr.*, xvi. sect. i. 555.—B. H., *Gen.*, 112, n. 4.—*Phyteuma* MAGN., *Prodr.*, 15.—*Luteola* T., *op. cit.*, 423, t. 238.—SPACH, *loc. cit.*, 103.—*Pectanisia* RAFIN., *Fl. Tell.*, 702.—*Tereianthes* RAFIN., *loc. cit.*, 704.—*Arkopoda* RAFIN., *loc. cit.*, 705.—*Eresda* SPACH, *loc. cit.*, 101.

petals, which may be reduced to a very narrow simple strap.[1] Above the corolla the receptacle expands into a flattened glandular disk with a fringed edge, which though complete all round is much more marked behind, or else is absent in front and so becomes crescent-shaped.[2]

Reseda lutea.

FIG. 323.
Fruit ($\frac{8}{1}$).

FIG. 322.
Long. sect. of flower.

FIG. 324.
Long. sect. of fruit.

On the free edge or a little lower on its interior surface are inserted the stamens, indefinite and very variable in number, whose symmetry is no longer apparent when adult[3] (fig. 322). Each consists of a free filament, and an introrse 2-celled anther of longitudinal dehiscence.[4] The gynæceum consists of a sessile or stipitate 1-celled ovary, tapering above into a variable number of stylar horns, each stigmatiferous at its tip. There are usually three or four, more rarely five or six, of variable position. The parietal placentas, of the same number as the styles with which they alternate, project more or less into the ovary, each bearing an indefinite number of descending campylotropous ovules with their micropyles superior and at first introrse.[5] The fruit (fig. 327) is capsular; it opens at the apex by short clefts radiating in a star and alternating with the placentas,

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[1] PAYER (*loc. cit.*, 194) has seen that the largest and most dissected petals are also the first to appear. As regards the scale at their base, he remarks, "It is only after all the ramifications of the petal have appeared, and are already well developed, that we see the origin of a transverse ridge nearly at the base of the petal, a sort of fold which grows very rapidly, and finally forms with the lower part of the petal the scale on whose nature so much has been written. This scale is hence, in fact, only a sort of appendage of the claw, quite analogous to that found on top of the claw of many *Caryophylleæ*.

[2] PAYER (*loc. cit.*, 195) has seen that this disk (on which, also, so many interpretations have been put) is only a partial swelling of the receptacle, which begins after the birth of the petals.

[3] See PAYER, *loc. cit.*, 196.

[4] The pollen consists of ellipsoidal grains, with three folds, which in water become ovoid with three bands. (H. MOHL., in *Ann. Sc. Nat.*, sér. 2, iii. 326.)

[5] They have two coats.

which by their increasing separation form a polygonal opening of as many sides as there were carpels. Through this escape the numerous campylotropous seeds (figs. 323, 324, 328, 329), which contain within their coats an arcuate fleshy exalbuminous embryo.[1]

The floral symmetry, the number and position of the various parts of the flower, the form of the petals, disk, placenta, and leaves, vary greatly in this genus from species to species, and even from flower to flower on a

Reseda luteola.

FIG. 325.
Habit ($\frac{1}{6}$).

[1] The seeds of *R. odorata*, for instance, are reniform, with the superior extremity, corresponding with the micropyle, but a little more acute. The micropyle is always superior and next the placenta, which has its cellular layer hypertrophied all round the insertion of the seed to form a truly papillose tissue, with very unequal prominences. A little below the micropyle is seen the umbilical cicatrix, to which a very short funicle adheres. The outer coat of the seed is soft and whitish, pretty thin over the greater part of the seed; but all round the hilum, over a nearly circular space corresponding with the notch of the kidney, and bounded above by the minute hole of the micropyle, this envelope is hypertrophied, of a more opaque white, and fungoid, forming a true umbilical aril. The second seed coat is thick, coloured, and crustaceous, with scattered unequal rugosities outside, showing even through the outer coat, and more marked dorsally than elsewhere. Next comes a thin soft whitish coat; and finally the thick fleshy oily embryo, resembling that in the *Cruciferæ*, bowed, with a superior conical radicle and thick plano-convex cotyledons, touching by their flat surfaces, and recurved towards the incumbent radicle, so that their organic apex is near the insertion of the seed.

given specimen; yet it is on these variations that sections or subgenera have been founded, which some authors have held to possess even generic rank. If for instance we study the true *Resedas*,[1] chiefly represented in our fields and gardens by *R. lutea*[2] (figs. 311, 320–324), *Phyteuma*,[3] *odorata*[4] (figs. 326–329), &c., we find that the leaves are simple, entire or deeply lobed, and that the placentas of the tricarpellary ovary are simple all along. In *R. lutea*, say, the flower is usually hexamerous; it has two posterior petals larger and more incised than the rest; a disk forming a deeply-curved crescent broadest behind; a very variable number of stamens whereof some are sterile (one anterior, or more; the flowers at the apex of the inflorescence may only have three fertile); and three placentas, whereof two are posterior, projecting above between the styles. In *R. odorata* (Mignionette) on the contrary, the more numerous stamens are often all fertile; the staminiferous disk projects behind into a ciliate scale; there are five or six stamens. *R. Phyteuma* has also one style posterior, a disk forming a bowed scale, and usually six petals and six sepals, both unequal.

In the Weld[5] (Fr., *Gaude*; fig. 325), the solitary type of a second section,[6] the gynæceum also usually consists of three carpels, but two styles are posterior and one anterior. The alternating placentas have their summits enlarged and bilobate; the flower is tetramerous with one petal posterior, larger and more incised than the rest. The staminigerous scale is large and posterior. The leaves are entire.

R. alba[7] with five or six other species forms a third subgenus with

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[1] Sect. *Resedastrum* (DUB., *Bot. Gall.*, i. 66; —M. ARG., *Mon.*, 116; *Prodr.*, 559, sect. ii).—Sect. *Reseda* ENDL., *loc. cit.*, b (part.).—*Reseda* RAFIN. (nec *Auctt.*), *loc. cit.*, 702.—SPACH, *loc. cit.*, 87.—*Pectanisia* RAFIN., *loc. cit.*, 704.

[2] L., *Spec.*, ed. 1, 449.—M. ARG., *Prodr.*, 571, n. 27.—*R. gracilis* TEN., *Viagg. in Bas. Cal.*, 122.—*R. gracilis* REICHB., *Ic. Fl. Germ.*, ii. 22, t. 102.—*R. lævigata* G. DON, *Gen. Syst.*, i. 289?.—*R. orthostyla* C. KOCH, in *Linnæa* (1845), 705.—*R. clausa* M. ARG., in *Bot. Zeit.* (1856), 39.

[3] L., *Spec.*, ed. 1, 449.—M. ARG., *Prodr.*, 563, n. 15.—*R. calycinalis* LAMK., *Fl. Fr.*, i. 204.—*R. odorata* GUELDENST., *It.*, i. 422 (nec L.).—*R. Tournefortii* SCHULT., *Obs.*, 89.—*R. aragonensis* LOSC. & PARD., *Arag.*, 14.—*Pectanisia Phyteuma* RAFIN., *loc. cit.*

[4] L., *Spec.*, ed. 2, 646.—M. ARG., *Prodr.*, 565, n. 18.

[5] L., *Spec.*, ed. 1, 448.—M. ARG., *Prodr.*, 583, n. 53.—*R. crispata* LINK, *En. Pl. Hort. Berol.*, ii. 8.—*R. pseudovirens* HAMP., in *Flora* (1837), i. 232.—*R. undulata* GILIB., *Fl. Lithuan.*, v. 210.—*R. salicifolia* GRAY, *Nat. Arr. Brit. Pl.*, ii. 666.—*R. Gussonii* BOISS., *Diagn. Or.*, ii. 49.—*Luteola resedoides* FUSS., *Fl. Transylv.*, 86.—*L. tinctoria* WEBB., *Phyt. Canar.*, 106.—*L. australis* WEBB, *loc. cit.*—*Arkopoda Luteola* RAFIN.

[6] Sect. *Luteola* DC., in *Dub. Bot. Gall.*, i. 67.—M. ARG., *Prodr.*, 582, sect. iv.—Gen. *Luteola* SPACH.

[7] L., *Spec.*, ed. 2, 645.—*R. ochracea* MŒNCH, *Meth.*, 58.—*R. myriophylla* MŒNCH, *loc. cit.*—*R. undata* DC., *Fl. Fr.*, i. 726 (nec L.).—*R.*

penta- or hexamerous flowers.[1] In the type species we see one sepal posterior; the petals larger and more divided as they are nearer this; a posterior disk forming a glandular scale; four carpels with four styles, whereof two are lateral, crowning the shortly stipitate

Reseda odorata.

FIG. 327.
Fruit ($\frac{5}{1}$).

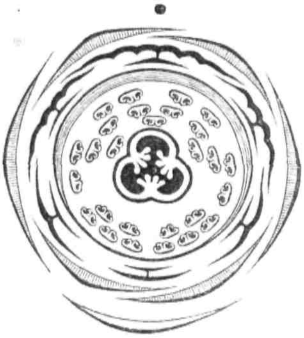

FIG. 326.
Diagram.

FIG. 328.
Fruit ($\frac{8}{1}$).

FIG. 329.
Long. sect. of fruit.

ovary; and lastly four placentas alternate with the styles, bearing descending ovules, with their micropyles introrse. The leaves are pinnatisect, which only occurs in this section.[2] Thus constituted, the genus *Reseda* contains some forty (?) herbaceous species, annual biennial and perennial, natives of the temperate and subtropical regions of the Northern Hemisphere, especially abundant on the borders of the Red Sea and Mediterranean.[3] All have alternate leaves, with two usually subulate or tooth-like lateral stipules, and flowers forming simple terminal racemes, more or less elongated according to the species.

Next to *Reseda* come two genera which have its habit, foliage, in-

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fruticulosa REICHB., *Syst. Veg.*, ii. 433.—*Tereianthes nudata* RAFIN.—*T. alba* RAFIN.—*T. fruticosa* RAFIN., *loc. cit.*

[1] *Leucoreseda* DC., in *Dub. Bot. Gall.*, i. 67.—M. ARG., *Prodr.*, 556, sect. i.—*Resedina* REICHB. (ex PETERM., *Deutsch. Fl.*, 67).—Gen. *Tereianthes* RAFIN., *Fl. Tell.*, n. 703 (part.).—*Eresda* SPACH, *Suit. à Buffon*, vii. 97.

[2] Botanists have also admitted a section *Glaucoreseda* [DC., in *Dub. Bot. Gall.*, i. 67;—M ARG., *Prodr.*, 580, sect. iii.;—*Leucoreseda* (part.) GREN. & GODR., *Fl. de Fr.*, i. 186 (nec DC.)], for *R. glauca* L., *gredensis* WILLK., *complicata* BORY, and *virgata* BOISS., possessing three entire placentas, and lobed, but not pinnatisect leaves (and yellowish flowers).

[3] REICHB., *Ic. Fl. Germ.*, t. 99–102.—BOISS., *Fl. Or.*, i. 421.—GREN. & GODR., *Fl. de Fr.*, i. 187.—WIGHT & ARN., *Prodr.*, i. 28.—WALP., *Rep.*, ii. 751; *Ann.*, i. 25; ii. 30; iv. 90; vii. 196.

florescence, and seeds, *Oligomeris* and *Caylusea*.[1] The flower of the former has only the two posterior petals, which may be free or connate. The capsule is 4-lobed at the apex. Five species[2] are known, natives of the Cape, excepting one from the East.[3]

Caylusea abyssinica.

FIG. 330.
Long. sect. of flower $(\frac{6}{1})$.

Caylusea[4] (fig. 330) has pentamerous flowers with the posterior petals more divided than the anterior. But the receptacle after bearing the perianth rises into a long obconical disk on top and inside of which are inserted the stamens, and the six carpels connate at the base; these form an ovary open above, wherein the alternicarpellary placentas are so approximated to the lower part as to become almost basilar. Hence the ripe open fruit resembles a six-lobed capsule. Of the two known species[5] one is a native of Abyssinia, the other of Northern Africa, extending also into Arabia and Persia.

Ochradenus,[6] comprising shrubs and undershrubs from the Mediterranean, has the flowers of *Reseda*, but without a corolla: while the pericarp does not open and becomes more or less[7] fleshy at maturity. The four known species[8] have simple linear leaves, often ill developed. Hence their aspect is quite peculiar; this is the case with *Randonia africana*,[9] a little branching Algerian shrub, with usually octamerous

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[1] CAMBESS., in *Jacquem. Voy.*, *Bot.*, 23, t. 25.—ENDL., *Gen.*, n. 5012.—B. H., *Gen.*, 112, n. 5.—PAYER, *Organog.*, 195; *Fam. Nat.*, 142.—M. ARG., *Prodr.*, 584.—*Dipetalia* RAFIN., *Fl. Tell.*, n. 707.—*Resedella* WEBB. & BERTH., *Phyt. Canar.*, 107, t. 9.—*Ellimia* NUTT., in *Torr. et Gray Fl. N.-Am.*, i. 125.—*Holopetalum* TURCZ., in *Bull. Mosc.*, xvi. i. 51.

[2] THUNB., *Fl. Cap.* (ed. 1823), 402 (*Reseda*).—HARV. & SOND., *Fl. Cap.*, i. 64.—BOISS., *Fl. Or.*, i. 43.—WALP., *Ann.*, vii. 202.

[3] The genus is divided into two sections: 1. *Resedella* (HARV.). Three or four superior stamens, of which two alternate with the petals.—2. *Holopetalum*. About ten stamens of peripheral insertion.

[4] A. S. H., in *Ann. Soc. Roy. d'Orléans*, xxiii.; *Deuxième Mém. sur les Résédac.*, 29.—ENDL., *Gen.*, n. 5014.—PAYER, *Organog.*, 108, t. 39, fig. 14; *Fam. Nat.*, 141.—M. ARG., *Mon.*, 225, t. 10; *Prodr.*, 550.—B. H., *Gen.*, 111, 970, n. 3.—*Hexastylis* RAFIN., *Fl. Tell.* (nec *Neog.*, 3).

[5] FORSK., *Fl. Ægypt.-Arab.*, 92 (*Reseda*).—VAHL, *Symb.*, ii. 52 (*Reseda*).—FISCH. & MEY., *Ind. Sem. Hort. Petrop.* (1840), 43.—WALP., *Rep.*, ii. 754; *Ann.*, vii. 195.

[6] DEL., *Fl. d'Eg.*, 15, t. 31, fig. 1.—SPACH, *Suit. à Buffon*, vii. 196.—ENDL., *Gen.*, n. 5010.—B. H., *Gen.*, 112, 970, n. 6.—M. ARG., *Prodr.*, 587.

[7] Slightly so in *Homalodiscus* (BGE., in *Boiss. Fl. Fr.*, i. 422), which has, moreover, a thinner disk, and hence forms a distinct section in the genus *Ochradenus*.

[8] DON., *Gen. Syst.*, i. 290 (*Reseda*).—M. ARG., *Mon.*, 94, t. 6, fig. 84.—BOISS., *Diagn. Or.*, ser. 2, i. 49 (*Reseda*), 50; *Fl. Or.*, i. 423 (*Homalodiscus*).—WALP., *Rep.*, ii. 751; *Ann.*, vii. 203.

[9] COSS., in *Bull. Soc. Bot. de Fr.*, vi. (1859), 301; in *Ann. Sc. Nat.*, ser. 5, i. 275, t. 21.—B. H., *Gen.*, 970, n. 2.—M. ARG., *Prodr.*, 554.—WALP., *Ann.*, vii. 195.

GENERA.

I. ASTROCARPEÆ.

1. **Astrocarpus** Neck.—Sepals 4–6, unequal imbricate. Petals 4–6, alternate unequal, membranous appendiculate at base, subentire or 2–∞-fid; posterior larger and more divided than anterior. Disk glandular, subsessile or more or less stipitate, expanded behind. Carpels 4–6, free, subverticilate at apex of stipitiform receptacle; style short, stigmatose within. Ovules 1, 2, descending campylotropous; micropyle introrse superior. Follicles stellately divaricate, 1-seeded. Seed reniform; embryo fleshy exalbuminous.—A herb, often woody branching from base; leaves alternate linear entire; stipules minute; flowers in terminal racemes; pedicels short (*South Europe*). See p. 291.

II. RESEDEÆ.

2. **Reseda** T.—Flowers irregular; calyx 4–8-partite, imbricate. Petals as many, unequal, subentire or 2–∞-fid; posterior more divided, and with a broader internal membranous appendage at base. Disk obliquely urceolate, much higher behind. Stamens ∞ (2–40) inserted inside disk, free. Germen sessile or stipitate at apex 3–4-lobed, more or less open between styles; placentas 3, 4, parietal, entire or 2-fid at apex; styles as many alternate, stigmatose at apex. Ovules ∞, descending, 2–6-seriate. Capsule gaping at apex, 3, 4-lobed. Seeds ∞, exalbuminous (of *Astrocarpus*).—Annual or perennial herbs, erect or decumbent, glabrous or pilose leaves alternate entire, lobed or pinnatisect; stipules minute; flowers racemose, bracteate (*Central and South Europe, West and Central Asia, North East, and South Africa*). See p. 294.

3. **Oligomeris** Cambess.—Flowers hermaphrodite; calyx 2–5-partite. Petals 2, alternating with posterior sepal, free or connate. Stamens 4, posterior, or often 3, alternate with petals (*Resedella*), or

6–10, inserted peripherally around germen (*Holopetalum*); filaments free or connate at base. Germen free, gaping at apex, formed of 4 (more rarely 5) connate carpels; 2 lateral; placentas 4, 5, parietal ∞-ovulate. Capsule 4–5-angular, gaping above; seeds ∞ smooth (of *Reseda*).—Herbs, annual or woody at base; leaves alternate or fascicled; flowers in lax spikes, 1-ebracteate (*South and North Africa, Canary Islands, South-west Asia, California*). See p. 299.

4. **Caylusea** A. S. H.—Flowers 5-merous irregular (nearly of *Reseda*); stamens 10–15, inserted on receptacle produced above perianth. Carpels 6, connate at base, open; ovules ∞, inserted on short erect subcentral placenta a little above base of carpel. Fruit dry, formed of stellately opening carpels; seeds few (of *Reseda*).—Annual herbs; habit and entire leaves of *Reseda;* flowers densely racemose (*Subtropical North Africa, West Asia, North-west India*). See p. 299.

5. **Ochradenus** DEL.—Flowers 5, 6-merous, apetalous. Disk greatly developed, peripheral or excentric-posterior, thick (*Euochradenus*) or more frequently thin (*Homalodiscus*). Stamens 10–30, peripheral (of *Reseda*). Germen 3-merous (of *Reseda*), gaping at apex, 3-dentate; ovules ∞, descending from 3 parietal placentas. Capsule finally succulent (*Euochradenus*) or dry (*Homalodiscus*), ∞-seeded.—Glabrous branching shrubs or undershrubs; branches virgate, finally leafless spinescent; leaves (on younger ones) small linear entire; flowers (sometimes polygamous) spicate or subracemose, 1-bracteate (*Mediterranean and Red Sea, South-west Asia*). See p. 299.

6. **Randonia** COSS.—Flowers ∞-merous; sepals connate at base, and inserted with as many alternating petals on margin of slightly concave receptacle. Stamens not more than 16, inserted perigynously with perianth; posterior possessing a membranous coronula at base. Germen inserted in bottom of receptacle, surrounded by a disk more developed behind; carpels 2, more rarely 3, connate into a germen gaping at apex; placentas as many, alternating parietal ∞-ovulate. Capsule gaping at apex; seeds 2–∞ (of *Reseda*).—A small branching subaphyllous shrub; leaves minute deciduous; branches virgate; flowers remote, 1-bracteate, in elongated subspicate terminal racemes (*Algeria*). See p. 299.

XX. CRASSULACEÆ.

Sedum Telephium (*Orpine*).

FIG. 331.
Habit.

The most complete type of this order is not the genus *Crassula*, to which it owes its name, but some genus with diplostemonous flowers such as *Sedum*[1] (figs. 331–337), wherewith we shall commence its study. The receptacle usually forms a depressed cone.[2] The calyx usually consists of five sepals, nearly free, or united for a variable extent below, valvate or imbricate in the bud. There are as many alternating petals, imbricate or twisted in the bud. The androceum consists of two whorls, of five stamens each, the outer superposed to the sepals, the inner to the petals. They may be distinctly hypogynous, and consist of a free filament[3] and a subbasifixed anther, whose two cells dehisce by an internal or marginal longitudinal cleft.[4] The gynæceum, inserted near the apex of the floral receptacle, consists of five oppositipetalous carpels, free or nearly so, each with an entire bilobed or emarg-

[1] T., *Inst.*, 262, t. 140.—L., *Gen.*, n. 579.—ADANS., *Fam. des Pl.*, ii. 248.—J., *Gen.*, 307.—GÆRTN., *Fruct.*, i. 313, t. 65.—POIR., *Dict.*, iv. 628; Suppl., iv. 206; *Ill.*, t. 390.—DC., *Prodr.*, iii. 401.—SPACH, *Suit. à Buffon*, v. 90.—ENDL., *Gen.*, n. 4622.—PAYER, *Organog.*, 365, t. 79.—B. H., *Gen.*, 659, n. 9.

[2] Sometimes flat or slightly concave.

[3] Their inner part is often covered with short hairs or projecting papillæ.

[4] The pollen consists of ellipsoidal grains with three folds, which when moistened, become spherical, with three bands. H. MOHL (in *Ann. Sc. Nat.*, sér. 2, iii. 331) distinguishes two

inate scale below and external to its base. The ovary is one-celled, tapering above into a style whose apex is stigmatiferous within. Each ovary contains in its ventral angle a parietal placenta, whose two vertical lips support a variable number of anatropous ascending ovules, with their micropyles turned downwards and outwards.[1] The fruit is formed of five free follicles which dehisce down the ventral edge to free the elongated seeds,[2] whose fleshy albumen[3] surrounds an embryo with an inferior radicle. In certain *Sedums* the flowers are tetramerous;[4] in others they become polygamous[5] by abortion. The transverse expansion of the receptacle often renders the insertion of the perianth and androceum more or less perigynous; and the stamens superposed to the petals may be adnate to them to a variable height. The oppositipetalous stamens are sometimes sterile;[6] sometimes the ovary cells have few ovules or only one.[7] At least one hundred quite distinct species of this genus are known,[8] herbs or undershrubs, glabrous or covered with glandular hairs. The various organs are

Sedum acre (*Stonecrop*).

FIG. 332.
Habit.

forms: "*a.* With papillose bands. *Sedum hispanicum, spurium, populifolium, acre. b.* Without papillæ? *S. reflexum.*"

[1] They have two coats, often closely united together below.

[2] They are usually wrinkled and dotted on the surface.

[3] This is very thin, or even reduced to a mere membrane, or often quite absent.

[4] They may, on the contrary, be 6–8-merous.

[5] Especially in *Rhodiola* (L., *Gen.*, n. 1124;—LAMK., *Ill.*, t. 819).

[6] Especially in *Procrassula* (GRISEB., *Spicil. Fl. Rum.*, 323;—*Telmissa* FENZL., *Pug. Pl. Syr.*, 14; *Ill. et Descr. Pl. Nov. Syr.*, 63, t. 16;—*Aithales* WEBB, *Phyt. Canar.*, i. 178). The carpels are here more or less coherent at the base.

[7] Especially in *S. pumilum* BENTH. (*Pl. Hartweg.*, 310).

[8] REICHB., *Pl. Crit.*, t. 841, 845.—DC., in *Bull. Soc. Philom.* (1801), n. 94; *Pl. Grass.*, t. 22, 33, 55, 59, 70, 92, 93, 101, 110, 115–120, 143.—GREN. & GODR., *Fl. de Fr.*, i. 617.—ROYLE, *Ill. Himal.*, t. 48.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 95.—A. GRAY, *Man.*, ed. 2, 140.—CHAPM., *Fl. S. Unit. States*, 150.—*Bot. Mag.*, t. 1807, 2224.—WALP., *Rep.*, ii. 260, 935; v. 795; *Ann.*, i. 324; ii. 670; vii. 919.

fleshy, as is most frequently the case in this order. The leaves are alternate or opposite, exstipulate, succulent, cylindrical (fig. 332) or flat (331),[1] entire or more rarely dentate or incised. The flowers[2] are

Sedum acre.

FIG. 333.
Flower ($\frac{3}{1}$).

FIG. 334.
Diagram.

FIG. 335.
Fruit ($\frac{3}{1}$).

sometimes solitary axillary, but oftener form regular or irregular[3] and unilateral cymes (fig. 332). All the cold and temperate regions of the Old World abound in species; they are less numerous in America.

Sedum acre.

FIG. 336.
Seed ($\frac{10}{1}$).

FIG. 337.
Long. sect. of seed.

S. pusillum,[4] from Carolina, has been proposed as the type of a genus *Diamorpha*,[5] because its carpels, usually four in number, are slightly united towards the base.[6] We shall place this small plant in a distinct section because its follicles open down the back.

Triactina verticillata,[7] a small Himalayan herb, has the habit and vegetative characters of many *Sedums*. It differs slightly therefrom in the following

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[1] As a rule in the section *Anacampseros* (T., *Inst.*, 264;—HAW., *Syn. Pl. Succ.*, 111, nec SIMS), which has turgid carpels and flat leaves.

[2] White, pink, violet, or bluish, but more frequently yellow.

[3] Owing to the flowers being carried up, or, as some express it, the pedicels adhering to or fused with the axes of the next degree. (See PAYER, *Elém. de Bot.*, 117, 118, 121, figs. 188, 191.)

[4] MICHX., *Fl. Bor.-Amer.*, i. 276.—*Tillæa cymosa* NUTT., *Gen. Amer.*, i. 110.

[5] NUTT., *Gen. Amer.*, i. 293.—DC., *Prodr.*, iii. 414; *Mém.*, ii. 42, t. 1, fig. 9.—ENDL., *Gen.*, n. 4624.—TORR. & GRAY, *Fl. N.-Amer.*, i. 561.—CHAPM., *Fl. S. Unit. States*, 150.

[6] Or rather their bases are inserted together nearly vertically on a somewhat elongated receptacle. This occurs in a lesser degree in several indigenous *Sedums*. Hence the inner edge of the carpels becomes nearly horizontal and superior.

[7] HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 90, 103.—B. H., *Gen.*, 661, n. 14.

characters. Its short unequal sepals are four in number, unsymmetrically arranged. Its gynæceum consists of but three carpels,

Sempervivum tectorum.

FIG. 338.
Flowers.

FIG. 339.
Long. section of flower.

while there are five petals and ten stamens of *Sedum*; and there are only three narrow scales at the foot of the gynæceum. Moreover, the carpels are united below for a somewhat variable distance. Each ovary contains two descending ovules. The fruit is formed of three carpels cohering below. *Triactina* has branching stems bearing alternate or pseudo-verticillate glabrous leaves. The flowers form cymes, chiefly uniparous; they are more or less carried up on the neighbouring branches, as in many species of *Sedum*.

Sempervivum tectorum.

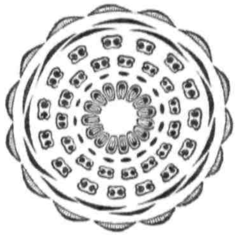

FIG. 340.
Diagram.

The Houseleeks[1] (Fr., *Joubarbes*; figs. 338–340) are *Sedums* with the floral symmetry of a higher number than five. When, as is sometimes the case, the flower is pentamerous, the only distinguishing character lies in the vegetative organs. The genus comprises herbs or rarely undershrubs, often stemless, with a rosette of succulent leaves arranged in a spiral of the greatest regularity. Axillary to the leaves buds are produced, often transformed into bulbels. The flowers end a common axis bearing reduced leaves or bracts, and form racemes or corymbs of cymes or glomeruli, which are often uniparous or scorpioid. The perianth is variable. In *Æonium*[2] and

[1] *Sempervivum* L., *Gen.*, n. 612.—J., *Gen.*, 307.—GÆRTN., *Fruct.*, i. 341, t. 65.—LAMK., *Dict.*, iii. 288; Suppl., iii. 176; *Ill.*, t. 413.—DC., *Prodr.*, iii. 411.—SPACH, *Suit. à Buffon*, v. 99.—ENDL., *Gen.*, n. 4623.—PAYER, *Organog.*, 367, t. 79.—B. H., *Gen.*, 660, n. 10 (incl.: *Æonium* WEBB, *Aichryson* WEBB, *Greenovia* WEBB, *Monanthes* HAW., *Petrophyes* WEBB & BERTH.).

[2] WEBB, *Phyt. Canar.*, i. 184, t. 28-35. The

Aichryson,[1] the calyx is often cup-shaped, pluridentate or plurifid. The petals are slightly imbricate, sometimes united for some way at the base. The stamens are either quite free, or united below with the bases of the petals, to which they are superposed. In certain *Æoniums*, and in *Greenovia*,[2] whose flowers have upwards of thirty sepals and as many petals, the scales of the disk superposed to the carpels in other sections are absent, and the floral receptacle is more or less concave. The real number of species[3] of House-leek[4] is estimated at about forty, but some describers have reckoned as many as a hundred. They inhabit the temperate and mountainous regions of Central Europe and Asia, and Continental and Insular Africa.

Cotyledon Umbilicus (*Pennywort*).

FIG. 341.
Inflorescence.

Monanthes[5] has rightly been made[6] a mere section of this genus; its flower is formed as in the other groups, with from six to twelve parts to the verticil. The sepals, petals, and diplostemonous androceum have a somewhat perigynous insertion on the thick receptacle, resulting from the expansion of the receptacle into a short inverted cone. The scale external to the base of each carpel is fan-shaped, larger across than in height, and shortly stipitate; or else it is divided into two cucullate lobes. The gynæceum, fruit, and seeds are

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flower is 6-12-merous. The scales of the disk are absent, or clavate or cordate.

[1] WEBB, *loc. cit.*, i. 181, t. 27. The flower is 5–12-merous, with ciliate scales.

[2] WEBB, *loc. cit.*, i. 198, t. 36.

[3] DC., in *Bull. Soc. Philom.* (1801), n. 49; *Mém.*, ii. 37, t. 1, fig. 4.—CAMBESS., in *Jacquem. Voy., Bot.*, t. 74.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 92.—GREN. & GODR., *Fl. de Fr.*, i. 628.—WALP., *Rep.*, ii. 263, 935; *Ann.*, i. 326; ii. 670; vii. 923.

[4] Sect. 6: 1. *Chronobium* (DC., *Pl. Rar. Jard. Gen.*, n. 21). Suckers 0. Flowers yellow or more rarely white. (JACQ., *Hort. Schœnbr.*, t. 464.—*Bot. Mag.*, t. 1963.)—2. *Jovibarba* (DC., *loc. cit.*, sect. ii.). Suckers springing from lowest axils. Flowers purple or pale yellow. (Species all European.)—3. *Aichryson* (WEBB). Calyx cyathiform, 5–12-merous. Scales ciliate. Carpels sunk in tube. (Species from Canaries. *Bot. Mag.*, t. 296, 1809.)—4. *Æonium* (WEBB). Calyx 6–12-merous. Scales of varying form, clavate obcordate or quadrate, or 0. (Species from Canaries and Madeira. *Bot. Mag.*, t. 1978, 1980.—*Bot. Reg.*, t. 1741; (1841), t. 61.)—5. *Monanthes* (HAW.). Flowers 6–12-merous. Scales petaloid flabellate, shortly stipitate. (Species 2 or 3, from Canaries.)

[5] HAW., *Rev. Pl. Succ.*, 68.—B. H., *Gen.*, 660, n. 11.—*Petrophyes* WEBB & BERTH., *Phyt. Canar.*, i. 201, t. 36, B, C.

[6] ENDL., *Gen.*, n. 4623 c.

formed as in the other species of *Sempervivum*. *Monanthes* includes two or three species from the Canaries,[1] humble perennial cæspitose herbs, with slender climbing dichotomous stems. The fleshy leaves are opposite or alternate, distant on the elongated branches, or approximated and rosulate. The small flowers form cymes, pluriparous, or uniparous and racemiform.

Cotyledon (Echeveria) racemosum.

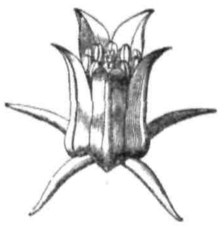

FIG. 342. Flower.

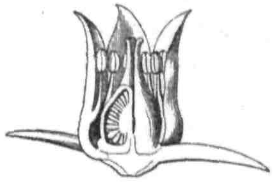

FIG. 343. Long. section of flower.

Cotyledon[2] (figs. 341–343) has regular pentamerous flowers. In *Umbilicus*,[3] the commonest species in this country, the calyx consists of five sepals, slightly united at the base. The corolla is somewhat longer and gamopetalous; the tube is pentagonal, with obtuse angles corresponding with the median line of the lobes. These are heart-shaped and acuminate, twisted or imbricate in the bud. The androceum consists of ten stamens, the five oppositipetalous a little the longer, all inserted on the corolla and adherent to it for a long way. The apex of the filament, alone free, bears an anther with two lateral cells, of marginal dehiscence. The gynæceum is formed as in *Sedum* and *Crassula*, with very numerous ovules[4] arranged in several rows. The oppositipetalous glands, corresponding with the back of the carpels, are quadrilateral and flattened.

Pistorinia[5] differs at first sight from *Cotyledon* in the length and slenderness of the tube forming the base of the corolla; but cannot be made a distinct genus owing to the transitional forms found in *Umbilicus*, where the corolla is often campanulate. The same applies to *Echeveria*,[6] wherein the tube is often broad and short, with sometimes almost complete polypetaly, but it is connected by certain trans-

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[1] DC., *Pl. Grass.*, t. 157; *Prodr.*, iii. 414. (*Sempervivum*, sect. iii.)—CURT., in *Bot. Mag.*, t. 93.

[2] L., *Gen.*, n. 578.—J., *Gen.*, 307.—DC., *Prodr.*, iii. 396.—ENDL., *Gen.*, n. 4618.—B. H., *Gen.*, 659, n. 8 (incl.: *Echeveria* DC., *Pachyphytum* KL., *Pistorinia* DC., *Umbilicus* DC.).

[3] L., *Spec.*, 615.—*C. umbilicata* LAMK., *Dict.*, ii. 140.—*C. rupestris* SALISB.—*Umbilicus pendulinus* DC., *Pl. Gr.*, t. 156; *Prodr.*, iii. 400, n. 6.—*U. Veneris* BLACKW., *Herb.*, t. 263.

[4] With two coats.

[5] DC., *Prodr.*, iii. 399.—ENDL., *Gen.*, n. 4619. A herbaceous erect annual, from Spain and Algeria. (DC., *Mém.*, ii. 25, t. 1; *Pl. Gr.* t. 122.—BOISS., *Voy. Esp.*, t. 63.)

[6] DC., *Prodr.*, iii. 401.—ENDL., *Gen.*, n. 4621.—*Pachyphytum* KL., in *Otto. et Diet.*

itional forms of *Cotyledon* proper with a cylindrical corolla of restricted gamopetaly. Hence these points will allow us to divide *Cotyledon* only into sections,[1] which are often ill-defined. Thus constituted it contains at least threescore species,[2] especially abundant in the warm and temperate regions of Africa, less so in Eastern and Central Asia, Mexico, and South and West Europe. They are herbs or undershrubs of most variable habit. The leaves, differing in thickness and succulence, may be alternate or opposite, distant as in *Sedum*, or approximated into a rosette as in *Sempervivum*, and are sometimes even peltate. The flowers are erect or pendulous, racemose spicate or cymose.

Bryophyllum calycinum.

FIG. 344. Flower.

Kalanchoe[3] and *Bryophyllum*, closely allied to *Cotyledon*, have tetramerous flowers. In the former the sepals are nearly or quite free, and the corolla is tubular hypocrateriform, often tumid at the base. The genus comprises herbs and undershrubs from Asia, tropical Africa, and the Cape, where there are a score, and one species is found in Brazil.[4] Their leaves are opposite and fleshy; their flowers form racemes of cymes. *Bryophyllum*[5] has the corolla of *Kalanchoe* (fig. 344); but the calyx is gamosepalous, cylindrical or tetragonal, with four teeth or rather

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Gartenz., ix. 9; in *Link, Kl. et Ott. Ic. Pl. Rar.*, ii. 43. Herbs or shrubs; calyx often well developed, and urceolate foliaceous fleshy; corolla urceolate, rounded or angular. Mexico, Peru, Japan ? (DC., *Mém.*, ii. 28, t. 5, 6.—CAV., *Icon.*, t. 170.—JACQ. F., *Eclog.*, t. 17.—SWEET, *Brit. Fl. Gard.*, iii. 275.—*Bot. Reg.*, t. 1247; (1840), 57; (1844), 1; (1842), 22, 29; (1845), 27; (1847), 57.—*Bot. Mag.*, t. 3570.—WALP., *Rep.*, ii. 259, 935; v. 794; *Ann.*, i. 323; ii. 669.)

[1] COTYLEDON. Sect. 4.
1. *Umbilicus* (DC.).
2. *Eucotyledon.*
3. *Echeveria* (DC.).
4. *Pistorinia* (DC.).

[2] LEDEB., *Ic. Fl. Ross.*, t. 57, 395.—GREN. & GODR., *Fl. de Fr.*, i. 630.—WEBB., *Phyt. Canar.*, i. t. 26.—HARV. & SOND., *Fl. Cap.*, ii. 370.—*Bot. Mag.*, t. 321, 2518, 2601, 4098.—*Bot. Reg.*, t. 915.—WALP., *Rep.*, ii. 257, 258; v. 792; *Ann.*, i. 323; ii. 668.

[3] ADANS., *Fam. des Pl.*, ii. 248.—DC., *Prodr.*, iii. 394.—ENDL., n. 4616.—B. H., *Gen.*, 659, n. 7.—*Calanchoe* PERS., *Syn.*, i. 445.—*Kalenchoe* HAW., *Syn.*, 109.—*Vereia* ANDR., *Bot. Repos.*, t. 21.—*Verea* W., *Spec.*, ii. 471.

[4] VENT., *Malm.*, t. 49.—DC., *Pl. Gr.*, t. 64, 65, 100.—WALL., *Pl. As. Rar.*, t. 166, 167.—WIGHT, *Ill.*, t. 111; *Ic.*, t. 1158.—HARV. & SOND., *Fl. Cap.*, ii. 378.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 91.—TUL., in *Ann. Sc. Nat.*, sér. 4, viii. 149.—WALP., *Rep.*, ii. 256; *Ann.*, i. 323; ii. 667.

[5] SALISB., *Par. Lond.*, t. 3.—DC., *Prodr.*, iii. 295; *Organogr.*, t. 22, fig. 2.—ENDL., *Gen.*, n. 4617.—B. H., *Gen.*, 658, n. 6.—*Crassouvia* COMMERS., mss. (ex ENDL.).—*Physocalycium* VEST, in *Flora* (1820), 409.

deeper valvate lobes. This genus also comprises succulent suffrutescent plants, with simple or imparipinnate opposite leaves; the flowers form large racemes of cymes. Three or four species are known[1] from the Cape; one of these has spread into almost all warm countries.[2]

Crasssula (figs. 345–353)[3] presents, with the same general organization as in the preceding types, an androceum reduced to a single alternipetalous verticil; and this alone distinguishes the genus. The flowers are hermaphrodite and regular. In most we find, inserted on a convex receptacle, a calyx of five sepals, free or united below, of valvate or imbricate præfloration, and a corolla of five alternating petals, free or slightly united at the base, imbricated or more rarely twisted in the bud. Each stamen has a free filament bearing an introrse 2-celled anther of longitudinal dehiscence.[4]

Crassula (Rochea) coccinea.

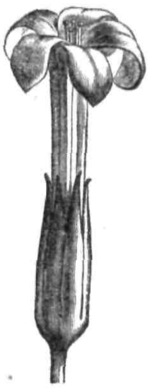

FIG. 345. Flower.

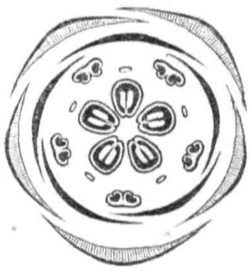

FIG. 346. Diagram.

Alternating with the stamens are five glands, often crescent-shaped, but varying in form, applied to the back of the carpels. These last are superposed to the petals; they are free; each is formed of a one-celled ovary, tapering above into a style which is stigmatiferous on the upper inner surface. Inside the ventral angle of each ovary is

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[1] DC., *Mém.*, 33.—WIGHT, in *Hook. Misc.*, App., t. 31.—HARV. & SOND., *Fl. Cap.*, ii. 380.—TUL., in *Ann. Sc. Nat.*, sér. 4, viii. 148.—*Bot. Mag.*, t. 1409, 5147.

[2] Remarkable for the power possessed by its leaves of developing reproductive buds under certain conditions. The species is *B. calycinum* SALISB.—*Crassouvia floripendula* COMMERS.—*Cotyledon pinnata* LAMK., *Dict.*, ii. 141.—*C. calyculata* SOLAND.—*C. rhizophylla* ROXB.—*C. calycina* ROTH.—*Calanchoe pinnata* PERS., *Syn.*, i. 446.

[3] L., *Gen.*, n. 392.—ADANS., *Fam. des Pl.*, ii. 248.—J., *Gen.*, 307.—LAMK., *Dict.*, ii. 170; Suppl., ii. 385; *Ill.*, t. 220.—DC., *Prodr.*, iii. 383.—SPACH, *Suit. à Buffon*, v. 74.—ENDL. *Gen.*, n. 4610.—B. H., *Gen.*, 657, n. 3.—*Gomara* ADANS., *loc. cit.* (incl.: *Bulliarda* DC., *Combesia* A. RICH., *Curtogyne* HAW., *Dasystemon* DC., *Dinacria* HAW., *Globulea* HAW., *Grammanthes* DC., *Helophytum* ECKL. & ZEYH., *Kalosanthes* HAW., *Larochea* PERS., *Margarella* B. H., *Petrogeton* ECKL. & ZEYH., *Pyrgosea* ECKL. & ZEYH., *Rochea* DC., *Sarcolipes* ECKL. & ZEYH., *Sphæritis* ECKL. & ZEYH., *Tetraphyle* ECKL. & ZEYH., *Thisantha* ECKL. & ZEYH., *Tillæa* MICH., *Turgosea* HAW.).

[4] The pollen is analogous to that of *Sedum*. It has three papillate bands in *C. (Septas) capensis* and *C. (Rochea) versicolor* (H. MOHL, *loc. cit.*).

a parietal placenta, bearing an indefinite number of anatropous ovules on either lip.[1] The fruit consists of five polyspermous follicles, which open down the ventral angle. The small seeds contain a fleshy embryo.

In certain species, such as *C. falcata*,[2] *coccinea*,[3] &c., the petals are more united than in the rest. Hence they have been made the type of a genus *Rochea*.[4] But as a rule there is no true gamopetaly here; but the petals only stick very closely together by their edges, or are kept in contact by the filament of the alternating stamen. Hence *Rochea* can only be made a section[5] of the genus *Crassula*.

Crassula parviflora.

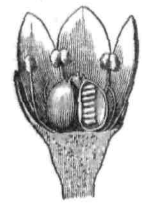

FIG. 347.
Long. sect. of flower.

C. dichotoma,[6] from the Cape, has also been proposed as the type of a new genus, under the name of *Grammanthes*,[7] because it was said to have a gamopetalous corolla, with no glands at the base of the carpels. But the glands exist, though ill developed; and the corolla is polypetalous, its leaves only sticking together by their edges, chiefly through the staminal filaments. Hence *Grammanthes* may be reduced to a section of the genus *Crassula*, characterized by its campanulate corolla, and Gentian-like habit, which this little herb owes to its opposite linear slightly fleshy glaucous leaves, and its so-called paniculate floral cymes.

In the neighbourhood of Paris is found a little *Crassula* which has been named *Bulliarda*[8] *Vaillantii* (figs. 348–353).[9] It has been thus made the type of a distinct genus, either because of its small size, or because of its flowers being usually tetramerous. But in organization of flower and fruit this little herb cannot be distinguished more

[1] With two coats.

[2] W., *Enum.*, 341.—DC., *Pl. Gr.*, t. 103.—*C. obliqua* ANDR., *Bot. Repos.*, 414.

[3] DC., *Pl. Gr.*, t. 1.—*Bot. Mag.*, t. 495.—*Larochea coccinea* HAW., *Syn.*, 50.—*Calosanthes coccinea* HAW., *Revis. Succ.*, 18.—COMM., *Rar.*, t. 24.—BRADL., *Succ.*, t. 50.

[4] DC., *Pl. Gr.*, n. 103; *Prodr.*, iii. 393, sect. ii. (*Franciscea*).—ENDL., *Gen.*, n. 4615.—*Kalosanthes* HAW., *Revis. Succ.*, 6.

[5] Spec. 4, South African. HARV. & SOND., *Fl. Cap.*, ii. 368.—*Bot. Reg.*, t. 320.—*Bot. Mag.*, t. 495, 2178.

[6] L., *Amœn. Acad.*, vi. 86.—*C. retroflexa* THUNB., *Fl. Cap.*, 282.—*C. gentianoides* LAMK., *Dict.*, ii. 175.—*Grammanthes chloræfolia* DC., *Prodr.*, iii. 392.—*G. gentianoides* DC., *loc. cit.*, 393.

[7] DC., *Prodr.*, *loc. cit.*—ENDL., *Gen.*, n. 4613.—HARV. & SOND., *Fl. Cap.*, iii. 331.—B. H., *Gen.*, 658, n. 4.—*Vauanthes* HAW., *Revis. Succ.*, 18.

[8] DC., in *Bull. Soc. Philom.* (1801), 49, n. 1; *Prodr.*, iii. 382. *Crassula* contains but few European plants.

[9] DC., *loc. cit.*—GREN. & GODR., *Fl. de Fr.*, i. 616.—PAYER, *Organog.*, iii. 368, t. 79.

than as a section of *Crassula*. The same applies to another minute native herb, *Tillæa*[1] *muscosa*.[2] This has trimerous or more rarely tetramerous flowers. But in warmer countries, especially South

Crassula (Bulliarda) Vaillantii.

FIG. 349.
Flower ($\frac{6}{1}$).

FIG. 348.
Habit.

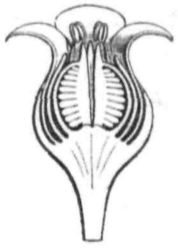

FIG. 350.
Long. sect. of flower.

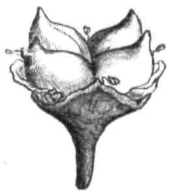

FIG. 352.
Fruit ($\frac{5}{1}$).

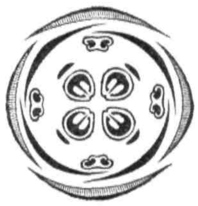

FIG. 351.
Diagram.

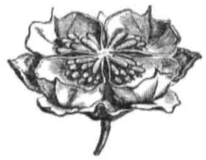

FIG. 353.
Fruit dehiscing.

Africa, many species are found,[3] analogous in habit and dimensions which have also pentamerous flowers; and then it is at once impossible to separate them in any way from *Crassula* proper.

C. filiformis, a minute species from the Cape, with the habit of *C. glabra, glomerata*, &c., has been made into the genus *Dinacria*,[4] because its carpels are surmounted by a little glandular dorsal prominence external to the style itself. But this character will only

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1 MICH., *Nov. Gen.*, 22, t. 20.—L., *Gen.*, n. 177.—DC., *Prodr.*, iii. 381.—ENDL., *Gen.*, n. 4607.—B. H., *Gen.*, 657, n. 1.—*Combesia* A. RICH., *Fl. Abyss. Tent.*, i. 307.—*Helophytum* ECKL. & ZEYH., *Enum.*, 288.—*Disporocarpa* C. A. MEY., *Ind. Sem. Hort. Petrop.*, viii. 56.

2 L., *Spec.*, 186.—LAMK., *Ill.*, t. 90.—GREN. & GODR., *Fl. de Fr.*, i. 616.

3 THUNB., *Fl. Cap.*, 281.—HARV. & SOND., *Fl. Cap.*, ii. 328 (*Helophytum*), 329 (*Bulliarda*).—HOOK., *Icon.*, t. 295, 310, 535.—REICHB., *Pl. Crit.*, t. 191.—F. MUELL., *Pl. Vict.*, t. 19.—BENTH., *Fl. Austral.*, ii. 450.—WALP., *Rep.*, ii. 251; v. 791; *Ann.*, i. 322; ii. 666.

4 HARV., *Fl. Cap.*, ii., 330.—B. H., *Gen.*, 657, n. 2.

suffice to distinguish a section, and that not well-defined, in this enormous genus.[1]

Crassula,[2] as thus defined, includes some hundred and fifty species.[3] Those belonging to *Tillæa* are cosmopolitan. The others are chiefly found in South Africa, and some in Abyssinia and the mountains of India. They are herbs, sometimes annual, more rarely shrubs, with opposite or alternate exstipulate fleshy leaves, which, like the stems vary greatly in form; so that the aspect of these succulent plants is very variable. The flowers[4] form ramified corymbiform cymes, usually terminal sometimes corymbiform or capituliform.

This order was made by B. DE JUSSIEU[5] to contain, under the name of *Sempervivеæ*, the then known genera of *Crassulaceæ* which we have just been through, besides most of those now referred to *Saxifrageæ*, *Portulacaceæ*, and *Droseraceæ*, together with *Cuscuta*, *Samolus*, *Forskalea*, &c., thus forming a very heterogeneous group. ADANSON[6]

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[1] The possession of unguiculate petals has also been given as characteristic of *Dinacria*, but they only taper gradually from above downwards.

[2] The limits of the sections are, as a rule, ill-defined; however, the following may be distinguished in practice: 1. *Eucrassula*. Petals spreading or reflexed, not tapering upwards, often mucronulate. [DC., *Pl. Gr.*, t. 19, 21, 37, 79, 103.—CAMBESS., in *Jacquem. Voy., Bot.*, t. 73 (*Larochea* PERS., *Enchir.*, i. 337 (part.).—*Rochea*, sect. *Danielia* DC., *Prodr.*, iii. 393.—*Kalosanthes* HAW., *Revis. Succ.* (part.), 5, 6.—*Turgosea* HAW., *loc. cit.*, 14.—*Curtogyne* HAW., *loc. cit.*, 8.—ECKL. & ZEYH., *Enum.*, 303.—*Sarcolipes* ECKL. & ZEYH., *loc. cit.*, 290.—*Petrogeton* ECKL. & ZEYH., *loc. cit.*, 291.—*Tetraphyle* ECKL. & ZEYH., *loc. cit.*, 292.—*Pyrgosea* ECKL. & ZEYH., *loc. cit.*, 298.—*Thisantha* ECKL. & ZEYH., *loc. cit.*, 302.]—2. *Grammanthes* (DC.). Calyx campanulate, nearly equal to tube of corolla. (PLUKEN., *Amalth.*, t. 145, fig. 6.—HARV. & SOND., *Fl. Cap.*, iii. 331.)—3. *Rochea* (DC., part.). Calyx shorter than tube of corolla, which consists of pieces sticking to one another and to the stamens, but seldom truly gamopetalous (see above, p. 312, note 4).—4. *Dinacria* (HARV.). Petals long-tapering at base. Carpels possessing a dorsal horn. Leaves opposite. (See above, p. 313, note 4.)—5. *Pyramidella* (B. H.). Petals elongated, long-tapering, canaliculate at apex. Leaves imbricate, 4-stichous [*Tetraphyle* ECKL. & ZEYH., *Enum.*, 292 (part)].—6. *Sphæritis* [ECKL. & ZEYH., *loc. cit.*, 299 (part.);—DC., *Pl. Gr.*, t. 7]. Petals panduriform, gradually tapering and canaliculate at apex.—7. *Margarella* (B. H.). Petals panduriform, attenuate tapering abruptly into a glandular canaliculate mucro [*Sphæritis* ECKL. & ZEYH. (part.), *loc. cit.*].—8. *Pachyacris* (B. H.). Petals lanceolate, at apex thickened glandular, 3-quetrous [*Sphæritis* (part.) ECKL. & ZEYH.].—9. *Globulea* (HAW., *Syn.*, 60; *Revis.*, 17;—DC., *Pl. Gr.*, t. 61, 133; *Prodr.*, iii. 390;—*Bot. Mag.*, t. 1940). Petals panduriform, bearing a gland below obtuse apex. Undershrubs with approximated or rosulate leaves; floriferous branches leafless.—10. *Eutillæa*. Flowers 3–5-merous. Calyx equal to corolla or shorter. (See above, p. 313, notes 1, 2, figs. 348–353.)—11. *Bulliarda* (DC.). Flowers usually 4-merous. Glands linear. Follicles many-seeded.—12. *Disporocarpæa* (C. A. MEY.) Petals sticking together at base. Glands very small. Ovules usually 2 in each carpel.—13. *Helophyllum* (ECKL. & ZEYH., *Enum.*, 288). Glands cuneiform truncate. Carpels usually 1-ovulate. (HARV. & SOND., *Fl. Cap.*, ii. 328.)

[3] WALP., *Rep.*, ii. 251 (*Tillæa*), 252; v. 791; *Ann.*, i. 322; ii. 666, 667; vii. 916.

[4] White, pink, red, or crimson, more rarely yellow or orange.

[5] *Ord. Nat.* (1759), in *A. L. Juss. Gen.*, lxix.

[6] *Fam. des Pl.*, ii. (1763), 13, 346, fam. xxxiii.

reduced it, under the name *Joubarbes* (*Seda*), to a smaller number, which would have been quite naturally associated had *Suriana* and *Tetracera* been omitted. A. L. DE JUSSIEU[1] in 1789 finally removed these two from his order *Semperviva*. Ten years later VENTENAT[2] named the group *Succulentæ*.[3] It at length received the name *Crassulaceæ* in the memoirs of A. P. DE CANDOLLE[4] at the beginning of this century. Herein he included, besides the numerous genera that had been split off from *Sedum*, *Sempervivum*, *Crassula*, &c., the genus *Penthorum*, of which JUSSIEU had only made a *genus affine*, and which we shall refer to *Saxifragaceæ*. Of all these genera we shall retain only the seven referred to above, including *Triactina*, founded by J. HOOKER and THOMSON in 1857.[5]

These eight genera contain about four hundred species.[6] Most of the genera are cosmopolitan; *Sempervivum*, *Bryophyllum*, and *Triactina* alone appear peculiar to the Old World. But if *Crassula*, *Sedum*, *Kalanchoe*, and *Cotyledon* are represented in America, it is but by very few species. Only one *Kalanchoe* occurs in Brazil, several *Cotyledons* in Mexico, and a few *Sedums*, besides *Diamorpha*, in both North and South America.

The *Crassulaceæ* are all succulent plants, and hence have a peculiar habit. The stems, and the leaves (in a yet higher degree), are thick and fleshy, with a rich succulent parenchyma, gorged with fluid. The vascular elements, few in proportion, often assume an arrangement corresponding with the form of the organs. When the leaves become thick and cylindrical, thus resembling the axes, the fibrovascular bundles are distributed in a circle around a central line occupied by fleshy parenchyma, like that which is found between the several bundles. In several genera, and notably in several House-leeks,[7] there are no true medullary rays, but only so-called medullary

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[1] *Gen.*, 207, ord. i.; in *Dict. Sc. Nat.*, xi. (1818), 269 (*Crassulæ*).

[2] *Tabl.*, iii. 271 (1799).

[3] LINNÆUS had united under this name, in his *Ordines Naturales*, a large number of very diverse fleshy plants, the same as HAWORTH did in 1812 in his celebrated *Synopsis Plantarum Succulentarum* (Lond., 8vo), wherein a large number of *Crassulaceæ* are studied with the rest.

[4] *Hist. des Pl. Grasses* (1799–1829); *Mém. sur la Fam. des Joubarbes* [in *Bull. Soc. Philom.* (1801), 1]; *Mém. sur la Fam. des Crassulacées*, Paris, 4to (1828); *Prodr.*, iii. (1828), 381, ord. 87. SPRENGEL calls them *Sedeæ*.

[5] In *Journ. Linn. Soc.*, ii. 90.

[6] LINDLEY counted 450, in 1846, in his *Vegetable Kingdom* (346, ord. 120).

[7] AD. BR., in *Arch. Mus.*, i. (1839), 437.

fibrovascular bundles, standing in definite relations with the leaves. In several *Crassulas* the absence of a woody zone has been demonstrated. The bundles of the medullary layer, consisting of tracheæ and spiral annular and reticulate ducts, increase in number and volume, without producing a woody parenchyma. In several *Cotyledons*[1] the wood has been seen formed of fibres only, free from vessels, and traversed by vertical bands of parenchyma consisting of thin-walled cells, between which spiral vessels are included. When the *Crassulaceæ* become woody, as in *Sempervivum arboreum*,[2] for instance, a stem several years old possesses a cortical cellular zone, with a suberous layer outside, and a herbaceous inside. The wood, formed of dotted thick-walled fibres, is traversed by scattered isolated vessels. In the thickness of the wood, untraversed by true medullary rays, are arranged peculiar concentric zones, formed of vessels and elongated quadrangular cells with a delicate unsculptured wall. Bundles formed of annular and unrollable spiral vessels, with elongated cells, occur in the wood all round the pith, which presents no peculiarity of structure. The same fundamental type, modified in details only, recurs in the other woody species belonging to *Crassula*, *Rochea*, *Cotyledon*, &c. The most general characteristics of the order[3] are the absence of liber and medullary rays in the adult wood; the presence of cords formed of fibroid cells and vessels, corresponding with isolated parts of the generative zone, within the body of the wood; and the predominance of the parenchymatous tissue, giving the organs their peculiar fleshy succulent consistency.

These peculiarities, and yet more the outward appearance due to the fleshy organs, have at all times induced a comparison between the *Crassulaceæ* and other succulent plants, especially *Cactaceæ* and *Mesembryanthemaceæ*. But they differ in their carpels, as remarked by A. L. DE JUSSIEU.[4] Hence he placed them in *Polypetalæ Perigynæ*, next *Saxifragaceæ*. *Penthorum*, made by him a *genus affine*

[1] LINK., *Icon. Sel.* (1839), fasc. 1, vii. 1, 2; in *Wiegm. Arch.* (1839), 224; in *Ann. Nat. Hist.*, iv. 241.—LINDL., *Veg. Kingd.*, 345. In *Sedum* the structure of the stem is much nearer that of normal *Dicotyledons*. The tuberous roots, however, present certain histological peculiarities (HENRY, *Ueb. die Bildung d. Wurzelfasern v. S. Telephium*, in *Verh. Nat. H.*, v. (1860, 61).

[2] REGNAULT, *Rech. sur les Affin. de la Tige des Pl. du Gr. des Cyclospermées* (in *Ann. Sc. Nat.*, sér. 4, xiv. 87).

[3] OLIV., *Stem. in Dicot.*, 16. (See also P. MAGNUS, in *Bot. Zeit.* (1871), 480.

[4] *Gen.*, 308: "*utpote polygynæ.*"

of *Crassulaceæ*, has neither the fleshy leaves, the habit, nor the dehiscence of the fruit of this order; it links it to *Saxifragaceæ*, wherein we class it. Its seeds have albumen, though far from copious; and this is really absent[1] as a rule in the ripe seeds of true *Crassulaceæ*.[2] When *Saxifragaceæ* have their carpels free, they are thereby distinguished from *Crassulaceæ*, which moreover are never woody. The *Francoeæ*, which among *Saxifragaceæ* come nearest to this order after *Penthorum*, are distinguished by the presence of albumen and the more intimate union of the carpels. The free gland found in *Crassulaceæ* outside the base of each carpel, is also usually absent in *Saxifragaceæ*.[3] De Candolle has also shown how *Crassulaceæ* pass into *Illecebreæ* through *Tillæa*. J. G. Agardh[4] also allies this order to *Tamariscineæ*. We ourselves, while holding like most living authors that it is inseparable from *Saxifragaceæ*, find that it is also closely allied to *Astrocarpeæ*, the polycarpic type of *Resedaceæ*. In *Astrocarpus* the vegetative organs are comparable with those of *Penthorum*; the gynæceum consists of free carpels as in the Houseleeks. And as the carpels become pluriovulate in *Resedeæ*, the only difference left between the two groups lies in the irregularity of corolla, androceum, and disk in *Resedaceæ*.

Many *Crassulaceæ* owe their uses[5] to the quantity of water contained in their fleshy succulent organs; this is especially true of the Houseleeks (*Joubarbes*), which are used as cooling applications to burns, abscesses and hæmorrhoids, and to soften warts and corns. The leaves are used entire, sliced or bruised, raw or rarely cooked, alone or in combination with oil or grease. The common Houseleek,[6] which is

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[1] A. L. de Jussieu admitted its presence: "*utpote perispermo seminis farinaceo instructæ;*" an opinion shared by Bentham & Hooker (*Gen.*, 656): "*albumen carnosum.*" Endlicher writes (*Gen.*, 808, ord. 169): "*embryo in axi albuminis orthotropus,*" and Lindley (*Veg. Kingd.*, 344, ord. 120): "*Embryo straight in the axis of fleshy albumen.*" But the existence of albumen is rightly denied by other authors (Ad. Br., *Enum.*, xxviii. cl. li.;—Lem. & Decne., *Traité Gén.*, 267).

[2] "*Cephalotus* is another type closely linking Crassulads and Saxifragads." (*Adansonia*, vi. 3.)

[3] "A *Crassulaceis* discrepant (*Saxifragaceæ*) præcipue habitu, defectu glandularum hypogynarum carpellisque rarius polyspermis; sed *Crassulaceæ* potius subordinem *Saxifragacearum* quam ordinem sistunt." (B. H., *Gen.*, 629.)

[4] *Theor. Syst.*, 343, t. 25, figs. 6–9. "*Crassulaceæ* sunt *Tamariscineæ* herbaceæ et nobilius corollatæ, mediante præcipue *Telephio* versus *Curvembryas* tendentes."

[5] Endl., *Enchirid.*, 406.—Lindl., *Veg. Kingd.*, 345; *Fl. Med.*, 275.—Guib., *Drog. Simpl.*, ed. 6, iii. 254.—Rosenth., *Syn. Pl. Diaphor.*, 573.

[6] *Sempervivum tectorum* L., *Spec.*, 664.—DC.,

in most request, also contains vegetable albumen, permalate of lime, &c., and was formerly taken internally in inflammatory and bilious fevers, &c. The White Stonecrop (*Petite-Joubarbe*, or *Trique Madame*),[1] was held to have similar cooling virtues, with a slight astringency that made it a vulnerary application. The Common Orpine or Livelong (*Orpin commun*; fig. 331)[2] is also used topically in the country to induce cicatrization. Many allied species of Stonecrop and Houseleek, very poor in active principles and rich in water, are used raw or cooked in the preparation of soup, as vegetables, or for poultices,[3] &c. But in some others acrid or even caustic principles are developed, which make them irritant, rubefacient, emetic, or purgative, so that care is needed in their use. The best known is our Wall Pepper (fig. 332–337),[4] which has a pungent disagreeable taste, and is sometimes prescribed as a resolvent. Dried and powdered it is here and there given in epilepsy. Pennywort or Navelwort (fig. 341)[5] is also thought to be of use in epilepsy. Other Crassulads appear to have special virtues. *Crassula tetragona*[6] is considered a good astringent, and is given with milk in diarrhœa by the Japanese. *Bryophyllum*

Pl. Gr., t. 104; *Prodr.*, iii. 413, n. 23.—SOW., *Engl. Bot.*, t. 1320.—GUIB., *loc. cit.*, 254.—LINDL., *Fl. Med.*, 275.—RÉV., in *Fl. Méd. du* xixe *Siècle*, ii. 184.—CAZ., *Traité des Pl. Méd. Indig.*, ed. 3, 536.—*Sedum tectorum* SCOP., *Fl. Carniol.*, ed. 2, n. 529 (*Artichaut des Toits, A. sauvage, Barbajou, Jombarbe, Herbe aux cors, Saxifrage pyramidale; Herba Sempervivi s. Sedi majoris* off.).

[1] *Sedum album* L., *Spec.*, 619.—DC., *Pl. Gr.*, t. 22; *Prodr.*, iii. 406, n. 48.—GUIB., *loc. cit*, 254, fig. 632.—ROSENTH., *op. cit.*, 574.—*S. teretifolium* LAMK., *Fl. Fr.*, iii. 48 (*Rasinet, Riz sauvage, Joubarbe blanche; Herba Sedi minoris lutei* off.).

[2] *S. Telephium* L., *Spec.*, 616, *a*, *β*, *γ*.—DC., *Pl. Gr.*, t. 92; *Prodr.*, iii. 402, n. 9.—GUIB., *op. cit.*, 255.—CAZ., *op. cit.*, 721.—*S. vulgare* LAMK. (*Reprise, Grassette, Joubarbe des Vignes, Herbe aux coupures; Herba Telephii s. Fabariæ s. Fabæ crassæ* off.). Its leaves, fresh or preserved in oil, are considered vulnerary, astringent and cooling. Many other Mediterranean species formerly enjoyed a similar reputation, viz.: "*Sedum altissimum* POIR. (Ἀείζωον τὸ μικρόν, DIOSC.), *S. stellatum* L. (Ἀείζωον τρίτον εἶδος), *S. Anacampseros* L. (Τηλέφιον, *Herba Anacampserotis* off.), *S. Cepæa* L. (Κηπαία)." (ENDL., *Enchirid.*, 406).—*S. amplexicaule* DC. has the same properties as *S. altissimum*. *S. purpureum* HAW. and *maximum* SUT. may be used instead of *S. Telephium*, as also *S. confertum* DEL., in Egypt.

[3] The chief species are *Sedum Telephium* L., *album* L., *reflexum* L., *Rhodiola* L., *longifolium* L., *Anacampseros* L., and *Sempervivum tectorum* L.

[4] *Sedum acre* L., *Spec.*, 619.—DC., *Pl. Gr.*, t. 117; *Prodr.*, iii. 407, n. 51.—BULL., *Herb.*, t. 30.—GUIB., *loc. cit.*, 256, fig. 633.—LINDL., *Fl. Med.*, 276.—CAZ., *op. cit.*, 538 (*Vermiculaire Brûlante, Joubarbe âcre, Marquet, Pain-d'oiseau, Poivre de murailles, Illecebra; Herba Sedi acris s. Illecebræ* off.). *S. sexangulare* L., a closely allied species, and *S. boloniense* LOIS., are much less acrid.

[5] *Cotyledon Umbilicus* L., *Spec.*, 615 *a*.—SOW., *Engl. Bot.*, t. 325.—*Umbilicus pendulinus* DC., *Pl. Gr.*, t. 156; *Prodr.*, iii. 400, n. 6.—GUIB., *loc. cit.*, 256 (*Cotylet, Nombril de Vénus, Copertoivole, Herbe aux hanches, à l'hirondelle, Ecuelles, Cymbalion, Queue-de-rondelle; Herba umbilici Veneris* off.). *C. orbiculatus* is also considered of use in epilepsy.

[6] L., *Spec.*, 404.—DC., *Pl. Gr.*, t. 19; *Prodr.*, iii. 384, n. 10. The same properties are ascribed to *C. portulacca* LAMK.

calycinum[1] (fig. 344) is said to be useful in cutaneous eruptions. *Kalanchoe laciniata*[2] is used in India and Bourbon in the topical treatment[3] of unhealthy ulcerations. *Sedum glaciale*[4] is said to be antiscorbutic, and a detergent for ulcers, cancers, &c. ; *S. longifolium* diuretic, and *S. Rhodiola*[5] resolvent. *Sempervivum montanum*[6] is considered a depurative and purgative in Persia, and the leaves of *S. tectorum* have been said to cure intermittent fevers. *S. glutinosum*[7] in Madeira, and *S. balsamiferum*[8] in the Canaries, are used to prepare fishing-nets and preserve them from decay. This appears due to a sort of glue, and also perhaps to a tanning substance, present in several Crassulads. Here even the commonest species of *Sedum*, *Sempervivum*, &c., cover the rockeries in our gardens ; they have the advantage of needing next to no culture. In the conservatory we find several exotic species, especially of *Crassula*, *Echeveria*, and *Bryophyllum*. *B. calycinum* is often cultivated so as to favour the development of adventitious buds on the edges or veins of its fleshy leaves, as noticed in every botanical textbook.[9]

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1 SALISB., *Par. Lond.*, 3 (see above, p. 131, note 2).—ROSENTH., *op. cit.*, 573. In the interior the leaves are taken as cooling. " Leaves acid at morn, insipid at noon, bitter at sunset." (ENDL., *Enchirid.*, 406.)

2 DC., *Pl. Gr.*, t. 100; *Prodr.*, iii. 395, n. 8. — *Cotyledon laciniata* L. — *Planta Anatis* RUMPH., *Herb. Amboin.*, v. t. 95.

3 The bruised leaves are used. Those of *K. brasiliensis* CAMBESS. (*Cotyledon brasilica* VELLOZ.) are also used as vulneraries in Brazil (ROSENTH., *op. cit.*, 573).

4 CLAR., in *DC. Fl. Fr.*, iv. 393. Probably only a form of *S. acre* L.

5 DC., *Fl. Fr.*, ed. 3, iv. 386; *Pl. Gr.*, t. 143; *Prodr.*, iii. 401, n. 1.—*S. roseum* SCOP., *Fl. Carn.*, ed. 2, n. 560 (nec STEV.). — *Rhodiola rosea* L., *Spec.*, 1465.—*R. odorata* LAMK., *Ill.*, t. 819 (*Rose-root, Midsummer-men, Mille-graines, Orpin rose*). Its root (*radix Rhodiæ* off.) smells of roses. It was formerly sold as a sedative, antiphlogistic, refrigerant, &c. Its leaves are said to be eaten roasted in the north of Europe.

6 L., *Spec.*, 665. — DC., *Pl. Gr.*, t. 105; *Prodr.*, iii. 113, n. 25.—JACQ., *Fl. Austr.*, v. App., t. 41.—ROSENTH., *op. cit.*, 576.

7 AIT., *Hort. Kew.*, ed. 2, 147.—JACQ., *Hort. Schœnbr.*, 4, t. 644.—SIMS., in *Bot. Mag.*, t. 1963.—LINDL., in *Bot. Reg.*, t. 278.—DC., *Prodr.*, 411, n. 6 (*Ensaiao* of Madeira).

8 WEBB, *Phyt. Canar.*, i. 181 (*Farroba, Alfarroba* of the natives). *S. arboreum* L. (*Spec.*, 664;—DC., *Prodr.*, n. 8) of the Mediterranean is no doubt 'Αείζωον τὸ μέγα of DIOSCORIDES (" hodie 'Αμάραντος et 'Αναστασία," ENDL., in Cyprus and Greece).

9 DC., *Organogr.*, t. 22.—LINDL., *Intr. to Bot.*, 58.—LEM., *Leç. Elém.*, 301, fig. 269. The leaves of *Crassula* (*Rochea*) *falcata*, when placed on damp earth, may also give rise to adventitious buds (A. S. H., *Morph. Veg.*, 222), as is the case with many other Crassulads cultivated in our gardens. [For details of fertilization of these plants by insects see H. MÜLLER, *Befrucht. d. Blumen durch Insekten*, 90.]

GENERA.

1. **Sedum** T.—Flowers regular, 5-merous (or more rarely 4, 6, 7-merous) hermaphrodite or polygamous; receptacle usually narrow. Sepals free or connate at base, usually small, thick, valvate. Petals free, imbricate or twisted. Stamens twice as numerous as petals, equal, usually slightly perigynous; filaments all free, or shorter ones adnate to base of petals; anthers sub-2-dymous, introrsely or latterly 2-rimose. Scales as numerous as petals, inserted external to base of carpels, entire or 2-fid. Carpels 5 (more rarely 4, 6, 7), free or more rarely connate at base, 1-celled, tapering above into style; apex stigmatose inside; ovales ∞, more rarely few or 1, oblique anatropous, inserted on ventral angle. Follicles 4–7 finally gaping internally or externally; seeds 1–∞, often dotted; embryo exalbuminous (or slightly albuminous); cotyledons fleshy; radicle cylindrical.—Undershrubs or far oftener herbs, perennial or rarely annual, fleshy, glabrous or pubescent; leaves alternate opposite or verticillate, exstipulate; flowers cymose; cymes regular, or by abortion uniparous, sometimes few-flowered (*Temperate and cold Regions of Northern Hemisphere, South America*). See p. 304.

2 ? **Triactina** HOOK. F. & THOMS.—Flowers nearly of *Sedum*, 4, 5-merous. Scales and carpels (of *Sedum*) 3, connate at base. Follicles 3, many-seeded.—An annual (?) herb; habit of *Sedum;* leaves (of *Sedum*) alternate opposite or verticillate, rather fleshy, entire; flowers in lax leafy racemes (*Temperate Himalayas*). See p. 306.

3. **Sempervivum** L.—Flowers nearly (of *Sedum*), 6–∞-merous, more rarely 5-merous. Sepals narrow, free or connate at base. Petals as many, alternate, free or connate at base, imbricate. Stamens ∞, usually twice as numerous as petals (very rarely of same number); filaments free; usually slightly perigynous at base, anthers ovate or 2-dymous. Scales ∞, superposed to carpels, simple or 2-fid, sometimes connate in pairs, more rarely 0, or more or less stipitate petaloid (*Monanthes*). Carpels (of *Sedum*) as numerous as petals and superposed to them; ovules ∞. Follicles ∞ (of *Sedum*); ∞-seeded. Undershrubs or

more frequently thick fleshy herbs, acaulescent and giving off axillary leafy offsets, or more rarely caulescent leafy; leaves alternate thick, often imbricate, sometimes revolute; floral cymes regular or irregular unilateral, sometimes spiciform, often dense (*Central and South Europe, West and Central Mountainous Asia, West-Insular and East Africa*). See p. 307.

4. **Cotyledon** L.—Flowers 5-merous; sepals equal to tube of corolla (*Echeveria*) or shorter. Petals connate; tube large, urceolate or cylindrical, sometimes much elongated (*Pistorinia*); lobes of limb small, imbricate or more frequently twisted, finally spreading. Stamens 10 (or very rarely 5), inserted in tube or throat of corolla; exserted or included. Carpels 5, oppositipetalous (nearly of *Sedum*), each with an external scale at base, ∞-ovulate. Follicles 5, ∞-seeded.—Undershrubs or herbs, sometimes scapigerous, varying much in habit; leaves alternate or opposite, sometimes rosulate, usually very thick and fleshy, sometimes peltate; flowers racemose, spicate (*Umbilicus*), or more frequently cymose; cymes sometimes uniparous, 1-bracteate (*Africa, West and Central Temperate Asia, Mexico, South and West Europe*). See p. 309.

5. **Kalanchoe** Adans.—Flowers nearly of *Cotyledon*, 5-merous; corolla hypocrateriform, persistent; tube urceolate; limb spreading. Stamens 8, all fertile, or 4 oppositipetalous antherless, minute or 0; anthers included. Carpels 4, scales, membranous follicles, and seeds, all of *Cotyledon*.—Undershrubs or herbs, usually erect, robust; leaves opposite, sessile or petiolate, entire, crenate or pinnatifid, fleshy; cymes (usually 2-chotomous) branching many-flowered (*Tropical Africa, Tropical and Eastern Asia, Brazil*). See p. 310.

6. **Bryophyllum** Salisb.—Flowers 4-merous (nearly of *Cotyledon* or *Kalanchoe*); calyx large inflated sacciform, terete or 4-zonal, shortly 4-fid or 4-dentate, valvate. Corolla urceolate or subcampanulate; limb 4-fid, twisted, finally spreading exserted. Stamens 8 inserted in sets on tube of corolla. Scales 4, carpels, and (∞-seeded) follicles, all of *Cotyledon* or *Kalanchoe*.—Thick fleshy herbs, frutescent at base; leaves opposite petiolate, simple or imparipinnate, crenate, sometimes gemmiparous; cymes (usually 2-chotomous) much branch-

ing; flowers crowded nutant (*Tropical Africa, all Tropical Regions*). See p. 310.

7. **Crassula** L.—Flowers 5-merous (more rarely 3, 4, or 6–9-merous); calyx partite, lobed or cleft. Petals equal to calyx or longer, free or more or less connate at base, sometimes contracted at base (*Dinacria*); præfloration contorted or imbricate. Stamens as numerous as petals; filaments free or more or less united with petals. Anthers ovate or oblong, sometimes sub-2-dymous (*Tillæa*). Scales as numerous as carpels, varying in form. Carpels superposed to petals and as numerous, free or connate at very base; ovules ∞, rarely few (*Tillæa*), sometimes 2 (*Disporocarpa*), or 1 (*Helophytum*); styles tapering; apex narrow or dilated, stigmatose; germen sometimes shortly horned behind below style. Follicles 1, or more often ∞-seeded; seeds exalbuminous or with scanty albumen of *Sedum*.—Shrubs, small shrubs, or more frequently herbs, annual or usually perennial, succulent fleshy; leaves opposite, sometimes connate at base, usually entire, very thick; flowers (large or small) cymose; cymes regular or unilateral, often much branching, racemiform or more frequently corymbiform or glomerate (*Warm and Temperate regions of Old World, more rarely of New*). See p. 311.

XXI. SAXIFRAGACEÆ.

I. SAXIFRAGE SERIES.

The Saxifrages[1] (figs. 354–364) have hermaphrodite flowers, usually, but not constantly regular. But even omitting this, their organization may present differences, especially in the form and rela-

Saxifraga tridactylites.

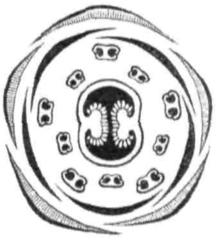

FIG. 355.
Diagram.

FIG. 356.
Fruit ($\frac{3}{1}$).

FIG. 354.
Habit.

FIG. 357.
Seed ($\frac{6}{1}$).

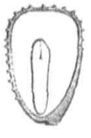

FIG. 358.
Long. sect. of seed.

tions of the receptacle and carpels, such as would elsewhere be held to distinguish genera or even orders. If we analyse the flowers of *Saxifraga crassifolia, cordifolia, ligulata, punctata, æstivalis,* &c., we find

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[1] *Saxifraga* T., *Inst.*, 252, t. 129.—ADANS., *Fam. des Pl.*, ii. 243.—L., *Gen.*, n. 559.—J., *Gen.*, 309.—GÆRTN., *Fruct.*, i. t. 177.—LAMK., *Dict.*, vi. 670; Suppl., v. 72; *Ill.*, t. 372.—DC., *Prodr.*, iv. 17.—SPACH, *Suit. à Buffon*, v. 40.—ENDL., *Gen.*, n. 4634.—PAYER, *Organog.*, 381; *Fam. Nat.*, 85.—B. H., *Gen.*, 635, n. 6.—H. BN., in *Adansonia*, v. 282; vi. 8 (inclus.: *Antiphylla* HAW., *Aulaxis* HAW., *Bergenia* MŒNCH, *Chondrosea* HAW., *Ciliaria* HAW., *Cotylea* HAW., *Dermasea* HAW., *Diptera* BORKH., *Geryonia* SCHR., *Hirculus* HAW., *Hydatica* NECK., *Kingstonia* GRAY, *Leptasea* HAW., *Ligularia* DUV., *Lobaria* HAW., *Megasea* HAW., *Miscopetalum* HAW., *Muscaria* HAW., *Oreosplenium* ZAHLBR., *Robertsonia* HAW., *Spathularia* HAW., *Zahlbrucknera* REICHB.).

a slightly dilated receptacle, bearing a calyx of five sepals, quincuncial in the bud, and a corolla of five free equal petals, imbricated in the bud. The stamens, also perigynous and free, like the petals, are ten in number, five superposed to the sepals, five, smaller, to the petals. Each consists of a filament bearing a two-celled anther of introrse or submarginal longitudinal dehiscence.[1] The gynæceum is free, mostly superior; it consists of two[2] carpels, antero-posterior, free or united below. Each has a one-celled ovary, covered at the base with a thin layer of glandular tissue representing a rudimentary disk, and tapering above into a style whose dilated apex is covered with stigmatic papillæ. In the ventral angle of the ovary is a parietal placenta, bearing an indefinite number of anatropous ovules. The fruit is dry, formed of two independent follicles, which open lengthwise to set free the indefinite small elongated seeds. These contain within their coats a fleshy albumen in whose axis is an embryo of very variable length.

Saxifraga crassifolia.

FIG. 359.
Long. sect. of flower.

FIG. 360.
Diagram.

In other species, such as *S. rotundifolia*, *Hirculus*, &c., the gynæceum is still quite free; and not only are the stamens hypogynous or subperigynous, but there is also an annular glandular disk, pretty high between their insertion and the base of the ovary. This consists of two carpels, united by the ventral surface so as to form two complete cells, with the placentas on the septum. We find numerous transitional forms between the two types of gynæceal organization; and in *S. Cymbalaria*, *umbrosa*, *hederacea*, &c., for instance, the free ovary is two-celled below, dividing above into two quite distinct horns, wherein the corresponding part of the placenta becomes quite free.

In other species again, with a gynæceum of variable form, the

[1] The pollen consists of elongated grains, with three folds. In water they become spherical with three bands. The bands are covered with papillæ in *S. crassifolia*, but lack them in *S. Cotyledon*. (H. MOHL, in *Ann. Sc. Nat.*, sér. 2, iii. 331.)

[2] The normal number is exceptionally three or four, tapering above into as many capitate styles in *S. trigyna* RÉM. (in *Ann. Sc. Nat.*, sér. 3, viii. 235), a little cæspitose species growing about the snow-line in Bolivia; but yet its other floral verticils are pentamerous.

form of the receptacle is altered; it becomes a cupule varying in depth, lined by a glandular disk, and bearing the perianth and androceum on its edges, while the free pistil is inserted in the bottom.

When the receptacular cavity becomes yet more concave, and campanulate sacciform or tubular, as in *S. oppositifolia*, *Cotyledon*, *Aizoon*, *hypnoides*, *granulata*, &c., while the carpellary leaves are inserted higher up and by a wider base on the inside thereof, the gynæceum becomes half, nearly, or almost completely inferior, and what was formerly termed adherent. Its two cells are complete for a great extent, with axile placentation; and it is only above that we find two one-celled ovaries with parietal placentation. The two styles always remain independent. At the same time the disk and the insertion of the perianth and androceum are forced higher up, passing gradually into the most marked perigyny or even epigyny. In this case the fruit is a half-inferior or inferior capsule, dehiscing from above downwards by two longitudinal clefts between the terminal stylar horns.

Saxifraga granulata.

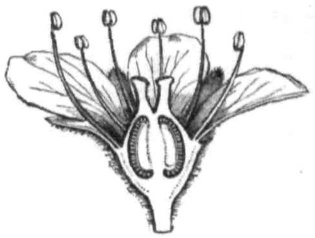

FIG. 361.
Long. sect. of flower.

Saxifraga irrigua.

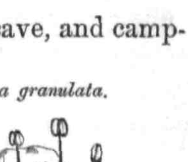

FIG. 362.
Long. sect. of flower.

Finally some species have an irregular corolla, like *S. sarmentosa* (figs. 363, 364), often cultivated for ornament; it has two large petals, and three smaller ones which may even disappear entirely; or else one large petal, two middle sized, and two small ones which may be quite absent.

Thus constituted,[1] the genus *Saxifraga* comprises about a hundred

[1] ENGLER, who has most recently revised this genus [*Ind. Crit. Specier. atque Synon. Gen.* Saxifraga (*Vindob.*, 1869)], admits seventeen sections, founded on the form and organization of the stems and leaves, the structure of the calyx, and the relative size of that and of the corolla: 1. *Calliphyllum* (GAUD.); — 2. *Cotyledon* (GAUD.); — 3. *Kabschia* (ENGL.); — 4. *Porophyllum* (GAUD.);—5. *Trigonophyllum* (GAUD.); 6. *Trachyphyllum* (GAUD.); — 7. *Arietaria* (STERNB.);—8. *Hirculus* (TAUSCH);—9. *Dactyloides* (TAUSCH);—10. *Ligularia* (HAW.);—11. *Robertsonia* (HAW.);—12. *Boraphila* (ENGL.); — 13. *Isomeria* (TORR. & GR.); — 14. *Peltiphyllum* (ENGL.);—15. *Micropetalum* (TAUSCH); —16. *Nephrophyllum* (GAUD.); — 17. *Cymbalaria* (GRISEB.).

and fifty species,[1] spread chiefly over the temperate Alpine and frigid regions of the Northern Hemisphere, less frequent in Temperate Asia and in South America, unknown in South Africa, Australia, and the Islands of the Pacific. They are herbs, perennial or more rarely annual. Their habit is very variable, like that of the subterranean

Saxifraga sarmentosa.

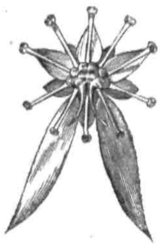

FIG. 363.
Flower ($\frac{2}{1}$).

FIG. 364.
Diagram.

parts, which may be thick rhizomes, or covered with fleshy bulbels as in our *S. granulata.* Some species are stoloniferous or climbing. The various organs are glabrous, or covered with hairs or glands. The leaves are alternate or opposite, very variable in form, with an often sheathing petiole, but no true stipules. The flowers, white pink or yellow, are rarely solitary, usually in cymes, sometimes unilateral, collected into pseudo-corymbs or compound racemes, terminal or more rarely axillary.

Under the name of *Zahlbrucknera*[2] has been wrongly made a distinct genus for a little Styrian and Carinthian *Saxifraga*,[3] whose petals, though smaller, resemble the sepals in colour and consistency, while the ovary is in great part inferior; the very slender herbaceous stem bears opposite or alternate lobed leaves, and solitary flowers borne on filiform axillary peduncles.

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[1] STERNB., *Revis. Saxifr.*, Ratisb. (1810).—HAW., *Enum. Saxifr.*, Lond. (1821).—GAUD., *Fl. Helv.*, iii. 83.—DON, in *Trans. Linn. Soc.*, xiii. 341.—AD. BR., in *Ann. Sc. Nat.*, sér. 2, iii. 48, t. 1, fig. 1.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 60.—A. GRAY, *Man.*, ed. 2, 142.—CHAPM., *Fl. S. Unit. States*, 153.—GREN. & GODR., *Fl. de Fr.*, i. 637, 661.—*Bot. Mag.*, t. 92, 196, 351, 424, 1651, 1664, 2207, 2959, 3026, 4915, 5066, 5377.—WALP., *Rep.*, ii. 362, 936; v. 824; *Ann.*, i. 336; ii. 687; v. 24; vii. 889.

[2] REICHB., *Fl. Germ. Excurs.*, 551.—ENDL., *Gen.*, n. 4633.—B. H., *Gen.*, 636, n. 7.

[3] *S. paradoxa* VEST, ex STERNB., *Rev. Saxifr.*, 22, t. 14.—ENGL., *loc. cit.*, 12, 34.—WALP., *Rep.*, ii. 362.

The flowers of *Chrysosplenium*[1] (figs. 365–367) are found on the whole as in *Saxifraga*; but they are apetalous, pentamerous or tetramerous, usually diplostemonous, more rarely isostemonous. The

Chrysosplenium alternifolium.

FIG. 366.
Tetramerous flower ($\frac{3}{1}$).

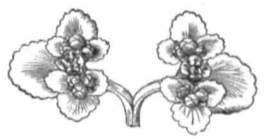

FIG. 365.
Inflorescence.

FIG. 367.
Long. sect. of gynæceum.

receptacle is obconical or urceolate, everted and of no great depth. The one-celled ovary becomes a partly inferior polyspermous capsule, dividing above into two equal or unequal lobes. Some fifteen species[2] are known, inhabiting the temperate and frigid regions of Europe, Asia, and North and South America. They are little annual or perennial herbs, with alternate or opposite exstipulate leaves, and little greenish axillary and terminal flowers.

Next to *Saxifraga* and *Chrysosplenium* come several other herbaceous genera, only differing in details; *Tellima, Mitella, Heuchera,* and *Tiarella*. In *Tellima*[3] (fig. 368) the ovary is partly inferior and one-celled, with two parietal placentas, a gamosepalous calyx with five deep divisions, five entire or lobed petals, and five or ten small included stamens, inserted on the periphery of a disk.[4] It consists of some half-dozen American species, herbs with alternate lobed or dentate leaves and racemose[5] flowers.[6]

Tellima grandiflora.

FIG. 368.
Flower ($\frac{2}{1}$).

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[1] T., *Inst.*, 146, t. 60.—L., *Gen.*, n. 558.—J., *Gen.*, 309.—GÆRTN., *Fruct.*, i. 208, t. 44.—LAMK., *Dict.*, ii. 311; *Ill.*, t. 516.—DC., *Prodr.*, iv. 48.—ENDL., *Gen.*, n. 4638.—B. H., *Gen.*, 638, n. 16.

[2] LEDEB., *Ic. Fl. Ross.*, t. 404, 405.—HOOK., *Journ.*, i. 354, t. 16, 17.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 73.—A. GRAY, *Man.*, ed. 2, 145.—CHAPM., *Fl. S. Unit. St.*, 154.—C. GAY, *Fl. Chil.*, iii. 42.—MAXIM., *Fl. Amur.*, 121.—GREN. & GODR., *Fl. de Fr.*, i. 660.—WALP., *Rep.*, ii. 368; v. 828.

[3] R. BR., in *Frankl. Journ. App.*, 765, obs.—DC., *Prodr.*, iv. 49.—ENDL., *Gen.*, n. 4642.—B. H., *Gen.*, 637, n. 12.—*Lithophragma* TORR. & GR., *Fl. N.-Amer.*, i. 583.

[4] In *T. grandiflora* R. BR. the whole of the inside of the receptacle is lined by a glandular layer. The petals are revolute after anthesis.

[5] HOOK., *Fl. Bor.-Amer.*, i. 239.—LINDL., in *Bot. Reg.*, t. 1178.—WALP., *Rep.*, ii. 371.

[6] Each flower is axillary to a denticulate bract, with two very minute lateral sterile bractlets.

Mitella[1] (figs. 369, 370) has ten or five stamens,[2] with five trifid or pinnatifid petals. But the floral receptacle is everted and shallow, so that the gynæceum is almost completely superior. The parietal multiovulate placentas are also those of a *Saxifraga*. The genus comprises four American species, and one from Eastern Asia.[3] They have the vegetative organs of *Tellima*, with flowers in slender elongated racemes. *Heuchera*[4] has five or six perigynous stamens, and entire petals[5] or no corolla. But the gynæceum and fruit are half-inferior.[6] There are some twenty species,[7] all North American. *Tiarella*[8] has the same habit, vegetative organs, and inflorescence: but the receptacle is scarcely concave; the gynæceum and fruit are

Mitella nuda.

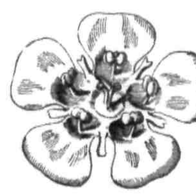

FIG. 369.
Flower ($\frac{5}{1}$).

Mitella (Mitellopsis) pentandra.

FIG. 370.
Flower ($\frac{4}{1}$).

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[1] T., *Inst.*, 241, t. 126.—L., *Gen.*, n. 561.—GÆRTN., *Fruct.*, i. 208, t. 44.—LAMK., *Dict.*, iv. 195; Suppl., iii. 710; *Ill.*, t. 373.—DC., *Prodr.*, iv. 49.—ENDL., *Gen.*, n. 4641.—B. H., *Gen.*, 638, n. 13.

[2] In the latter case the stamens that disappear are sometimes the oppositipetalous, sometimes the alternipetalous (fig. 370). The pentandrous species are made by some authors into a distinct genus, *Mitellopsis* (MEISSN., *Gen.*, 136; *Comm.*, 100.—ENDL., *Gen.*, n. 4640.—? *Oreanthus* RAFIN., in *Ser. Bull. Bot.*, i. 216.—*Drummondia* DC., *Prodr.*, iv. 49).

[3] HOOK., *Fl. Bor.-Amer.*, i. t. 82; in *Bot. Mag.*, t. 2933.—LINDL., in *Bot. Reg.*, t. 166.—TORR. & GRAY., *Fl. N.-Amer.*, i. 585.—A. GRAY, *Man.*, ed. 2, 145.—CHAPM., *Fl. S. Unit. States*, 154.—WALP., *Rep.*, ii. 370 (*Mitellopsis*), 371.

[4] L., *Gen.*, n. 320.—J., *Gen.*, 308.—GÆRTN., *Fruct.*, i. 177, t. 362.—LAMK., *Dict.*, iii. 127; Suppl., iii. 49; *Ill.*, t. 184.—DC., *Prodr.*, iv. 51.—ENDL., *Gen.*, n. 4639.—B. H., *Gen.*, 638, n. 14.

[5] In *H. americana* L. (*Spec.*, 328) the margins of the petals are a little ciliate. The petals are purple and spathulate in *H. glabra* DC., white and revolute, with a very slender claw in *H. micarntha*. They form long linear straps in *H. himalayensis*. *H. cylindrica* is often hexapetalous.

[6] In several species, like *H. americana*, we pretty often find developed under culture, besides the five unequal alternipetalous stamens, a sixth exactly in front of a petal. Here, and in *H. cylindrica*, the ovary is normally gaping at the apex, for the carpellary leaves become quite independent above the placentas. *H. cylindrica* has unequal sepals, and no corolla. The anthers are tetragonal, and dehisce laterally, but the insertion of the filament is dorsal. The disk is very thin. In *H. micrantha* the inflorescence is a raceme of biparous cymes, becoming uniparous at the apex. The stamens have basifixed anthers and a quite lateral dehiscence. The disk, very thin in most of the species, is here represented by a yellow epigynous glandular layer. The petals, tapering greatly at the base, become revolute in anthesis. The ovary is half inferior, but the placentas do not extend beyond the level of the base of the carpellary leaves.

[7] HOOK., *Fl. Bor.-Amer.*, i. t. 79.—TORR. & GRAY, *Fl. N.-Amer.*, i. 577.—*Bot. Reg.*, t. 1302, 1924.—WALP., *Rep.*, ii. 369; *Ann.* i., 337; iii. 897; v. 29; vii. 900.

[8] L., *Gen.*, n. 560.—J., *Gen.*, 309.—LAMK., *Dict.*, vii. 657; *Ill.*, t. 378.—DC., *Prodr.*, iv. 50 (part.).—ENDL., *Gen.*, n. 4643.—B. H., *Gen.*, 637, n. 11.—? *Blondea* NECK., *Elem.*, n. 786 (ex ENDL., nec RICH.).

almost wholly superior; and the stamens are much exserted (fig. 371). The two carpels are very unequal, and the placentas are relegated right down to the base of the ovary.[1] The capsule opens broadly above, gaping into two very unequal membranous valves (fig. 372). Of the five known species,[2] one comes from the Himalayas, the rest from North America. They have a perennial rhizome, alternate leaves, and flowers in simple or ramified terminal racemes.

Tiarella cordifolia.

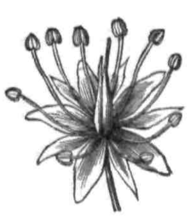

FIG. 371.
Flower ($\frac{3}{1}$).

FIG. 372.
Fruit ($\frac{2}{1}$).

Boykinia[3] may be considered as *Saxifraga* with an inferior ovary, and with the androceum is reduced to the five alternipetalous stamens. Five species are known,[4] all perennial herbs from North America, with their organs covered with glandular hairs; their leaves are alternate, with setaceous stipules, and the flowers form terminal racemes of cymes.[5]

Sullivantia ohioensis[6] has also small flowers, closely analogous to those of the Saxifrages, with only five alternipetalous stamens. But the receptacle is shallow, lodging only the lower part of the ovary; this divides above into two distinct bodies. Hence the fruit is a half-superior capsule; it contains numerous scobiform seeds. The plant is a perennial herb from North America, with alternate leaves and flowers in di- or trichotomous cymes.

Oresitrophe montana[7] is, like *Chrysosplenium*, an apetalous Saxifrage with pentamerous flowers, and an androceum which is at least

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[1] The carpels are like two little rolled up leaves, prolonged into cornets cleft on the inside. The receptacle forms a shallow obconical cup. The tetragonal basifixed anthers open laterally.

[2] HOOK., *Fl. Bor.-Amer.*, i. 238, t. 77, 81.—TORR. & GRAY, *Fl. N.-Amer.*, i. 587.—A. GRAY, *Man.*, ed. 2, 145.—CHAPM., *Fl. S. Unit. States*, 154.—*Bot. Mag.*, t. 1589.—WALP., *Rep.*, ii. 372 (part.).

[3] NUTT., in *Journ. Acad. Philad.*, vii. 113.—ENDL., *Gen.*, n. 4632[1].—B. H., *Gen.*, 636, n. 8.

[4] TORR. & GRAY, *Fl. N.-Amer.*, i. 576.—WALP., *Rep.*, ii. 362.

[5] Next to this genus comes, doubtfully, *Bolandra californica* A. GRAY (in *Proc. Amer. Acad.* (1867), vii. 341), which has pentamerous flowers, with perigynous persistent petals, five stamens, and a two-celled ovary, surmounted by two short styles. This genus appears at once allied to *Tellima*, *Tolmiea*, and *Tiarella*.

[6] TORR. & GRAY, in *Sillim. Journ.*, xlii. 22, not.—A. GRAY, *Chlor. Bor.-Amer.*, 38, t. 6; *Bot. N. Unit. St.*, 144.—B. H., *Gen.*, 636, n. 9.

[7] BUNGE, *Enum. Pl. Chin. Bor.*, 31.—ENDL., *Gen.*, n. 4646.—B. H., *Gen.*, 639, n. 17.—WALP., *Rep.*, v. 828.

diplostemonous.[1] But the receptacle is a shallow cup, so that the gynæceum is almost wholly superior. The placentas are parietal and multiovulate in the lower part, which forms a single cell; above the carpels are separate, and end in subulate styles. Hence the capsular fruit appears nearly free, and almost entirely divided into two horns; it opens at maturity by two interstylar valves. *O. montana* inhabits the North of China. It is a perennial herb,[2] with a thick scaly rhizome, having usually only one radical leaf, ovate-cordate, serrate, with a thick petiole. Its flowers form dichotomous cymes at the top of a common scape.

The flowers of *Astilbe*,[3] pentamerous or more rarely tetramerous, have a concave receptacle framing the base of the carpels, which are pluriovulate and united below, surmounted by two or three distinct styles. On the rim of the receptacle are inserted the valvate or imbricate sepals, the petals (which may be absent), and a diplostemonous androceum, with short subdidymous anthers. The fruit is dry and capsular, formed of two or three carpels, containing numerous scobiform seeds, whose outer coat is prolonged at each end into a sort of lax membrane; the embryo is surrounded by fleshy albumen. *Astilbe* comprises half a dozen species,[4] from India, Java, China, Japan, and North America. They are perennial herbs, whose rhizome gives off branches covered with alternate leaves, bi- or tri-ternate, compound or decompound, with serrate leaflets. Adnate to the base of the dilated petiole are membranous stipules. The flowers form spikes or racemes, which may be simple or composed of cymes. We make *Rodgersia podophylla*[5] of Japan a mere section of this genus; it has the same floral organization, with the basal leaves digitate or pedate, and the cauline trilobate; and its flowers are apetalous, sessile or subsessile, arranged along the numerous axes of the inflorescence in cymes which are usually uniparous and scorpioid.

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[1] Several flowers have from twelve to fourteen stamens.

[2] Its habit is compared to that of certain *Begonias*. The single aerial leaf developes after the flowers; these are at first pink, but ultimately turn green.

[3] HAMILT., in *Don Prodr. Fl. Nepal.*, 210.—DC., *Prodr.*, iv. 51.—ENDL., *Gen.*, n. 4645.—B. H., *Gen.*, 634, n. 4.—*Hoteia* MORR. & DCNE., in *Ann. Sc. Nat.*, sér. 2, ii. 316, t. 11.—ENDL., *Gen.*, n. 4644.

[4] VENT., *Malmais.*, t. 54 (*Tiarella*). — CAMBESS., in *Jacquem. Voy.*, *Bot.*, t. 58 (*Spiræa*).—V. HOUTTE, *Fl. des Serr.*, n. 1207.—*Bot. Mag.*, t. 3821 (*Hoteia*), 4959.—WALP., *Rep.*, ii. 372 (*Hoteia*); *Ann.*, i. 976 (*Hoteia*); v. 29; vii. 888, 889 (*Rodgersia*).

[5] A. GRAY, in *Mem. Amer. Acad.*, ser. 2, vi. 389.—B. H., *Gen.*, 635, n. 5.

The small flowers of *Lepuropetalon spathulatum*[1] are formed nearly as in the Saxifrages, with a deep receptacle lodging a half-inferior ovary in its concavity, and bearing on its edges five sepals, five petals, and five alternipetalous stamens. The placentation is exceptional in this order; there are three multiovulate parietal placentas in the one-celled ovary, with as many branches to the style. The fruit opens above into three triangular flaps, each surmounted by a branch of the style, revealing the seeds inserted on a line continuous with this branch. The seed-coats are rugose outside, and surround the fleshy albumen, with a little axile embryo. This curious annual, of minute size,[2] inhabits the United States and Chili; it is ramified, glabrous, almost fleshy, with alternate or subopposite exstipulate leaves, and solitary terminal flowers.

Leptarrhena,[3] on the contrary, is in form of receptacle and organization of gynæceum analogous to the Saxifrages with an almost superior ovary and independent carpels. But the ten stamens have one-celled anthers, and the placentas are confined to the lower part of the carpels. These last are in the fruit dry and coriaceous, erect, rostrate, and dehiscing ventrally. The seeds are prolonged into a long narrow point above and below, so as to be very elongated and spindle-shaped. *L. pirolifolia* R. Br.,[4] owes its name to the form of its so-called radical leaves, which are petiolate, coriaceous, persistent, obovate, and serrate. Its flowers are in cymes, ending an erect scape. This plant is found in Kamschatka, and about the same latitude in North America.

Tolmiea[5] represents the irregular form of the preceding types; the receptacle and perianth together form a cornet cleft right down its anterior edge, with its mouth very obliquely bevelled downwards and forwards. In front it is edged by the two small sepals; behind

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1 Ell., *Carol.*, i. 370.—DC., *Prodr.*, iv. 53.—Endl., *Gen.*, n. 4637.—B. H., *Gen.*, 639, n. 18.—*Cryptopetalum pusillum* Hook. & Arn., *Bot. Misc.*, iii. 344.

2 It is sometimes a centimetre in height, with a single terminal flower that appears almost radical, and several subjacent leaves, usually covered with little elongated brownish glands. In other cases, branches, also ending in a flower, develope in the axils of these leaves, and so on. Specimens occur wherein the solitary flower alone forms above half the bulk of the aerial part of the plant.

3 R. Br., in *Parry's First Voy.*, Suppl., 273, obs.—DC., *Prodr.*, iv. 48.—Endl., *Gen.*, n. 4635.—B. H., *Gen.*, 634, n. 3.

4 *Loc. cit.*—Hook., *Fl. Bor.-Amer.*, i. t. 89.—Walp., *Rep.*, v. 827.—*Saxifraga pirifolia* Sternb., *Saxifr.*, Suppl., t. 2.

5 Torr. & Gray, *Fl. N.-Amer.*, i. 582 (nec Hook.).—Endl., *Gen.*, n. 4639[1].—B. H., *Gen.*, 638, n. 15.

are the three larger ones, each with a fertile stamen superposed (fig. 373); and between the sepals are seen long capillary filaments, which are considered petals. The free dicarpellary gynæceum and capsular fruit are those of a Saxifrage. *Menziesia*,[1] the only known species of the genus, is a North American perennial, with a creeping rhizome, which gives off aerial branches covered with leaves; these are alternate, cordate, incised-lobate, with membranous stipules; the flowers are on drooping pedicels in terminal racemes.

Tolmiea Menziesii.

FIG. 373. Diagram.

Eremosyne pectinata[2] is a little Australian herb, with the aspect of a small Caryophyllad, and possessing a slender annual stem, with alternate lobed leaves. The small flowers grouped in ramified dichotomous cymes are nearly those of a Saxifrage as regards the half-inferior dicarpellary gynæceum, the pentamerous calyx and perigynous corolla and androceum. But in each of the nearly complete cells of the ovary is only a single subbasilar ovule, attached to the ventral angle, and ascending, with its micropyle downwards and inwards (?). The fruit is a little membranous loculicidal capsule, compressed at right angles to the septum. The seeds contain fleshy albumen surrounding the embryo.

The receptacle of *Vahlia* (figs. 374, 375)[3] forms a hollow hemisphere or short cornet, but on its edges are inserted five valvate sepals, five shorter alternating petals, and five epigynous stamens, whose filaments are inserted around a little circular disk framing the base of the styles; they are often dilated at the base into a sort of scale, and then taper to the apex, which bears an introrse two-celled anther of longitudinal dehiscence. The ovary is inferior, one-celled, with two or more, rarely three very imperfect septa projecting into its cavity, and separating the two or three placentas to a variable extent. These are ovoidal, suspended in the ovary by the narrow end (fig. 375), and are covered with small anatropous ovules.[4] The

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[1] *Heuchera Menziesii* HOOK., *Fl. Bor.-Amer.*, i. t. 80.

[2] ENDL., in *Hueg. Enum.*, 53; *Gen.*, n. 4629; *Iconogr.*, t. 112.—B. H., *Gen.*, 634, n. 2.—BENTH., *Fl. Austral.*, ii. 449.

[3] THUNB., *Nov. Gen.*, ii. 36 (nec DAHL).—J., *Gen.*, 318.—LAMK., *Dict.*, viii. 284; *Ill.*, t. 183; R. BR., in *Frankl. Journ.*, 766.—DC., *Prodr.*, iv. 53.—ENDL., *Gen.*, n. 4631.—PAYER, *Fam. Nat.*, 86.—B. H., *Gen.*, 637, n. 10.—*Russelia* L. FIL., *Suppl.*, 24 (nec JACQ.).—*Bistella* DEL., *Cent. Pl. Afr.*, in *Caill. Voy.*, 97, t. 63, fig. 2.

[4] The styles are short or elongated.

numerous seeds are small and albuminous. The four known species of *Vahlia*[1] inhabit Asia, but chiefly Tropical and South Africa. They are annual herbs, often glandular and pubescent, with dichotomous stems and branches. The leaves are opposite, entire, exstipulate. The flowers are paired in the axils of the leaves; and the latter being replaced by opposite bracts at the end of the branches, form terminal racemes or spikes.

Vahlia capensis.

FIG. 374. Flower ($\frac{4}{1}$).

FIG. 375. Long. sect. of flower.

Donatia[2] has hermaphrodite flowers, with a hollow obconical receptacle. On its rim are usually inserted five sepals, and five alternating petals; and in the concavity is the ovary, three-celled, with a multiovulate placenta descending in a mass, with the ventral angle of each cell. The top of the ovary is slightly concave; on it we see three recurved subulate styles, stigmatiferous at the apex, and corresponding with the cells below; alternate with them stand three stamens, whose subulate filaments are slightly coherent at the base, and bear a didymous extrorse anther. The fruit is dry and three-celled, and finally opens broadly at the apex. It then forms a conical sac with two or three divisions, containing numerous oblong, glabrous seeds, diverging in all directions from the very narrow surface on which they are attached. Some flowers of *Donatia* may have seven or eight sepals and ten petals; others have only two cells to the ovary, two styles, and two alternating stamens. Two species of this genus are known,[3] one from the extreme South of America, the other from the heights of New Zealand and Tasmania.

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1 REICHB., *Ic. Exot.*, t. 91.—WIGHT, *Ill.*, t. 115; *Icon.*, t. 562, 563.—HARV. & SOND., *Fl. Cap.*, ii. 306.—WALP., *Rep.*, ii. 362; *Ann.*, ii. 687; vii. 900.

2 FORST., *Char. Gen.*, 9, t. 5.—J., *Gen.*, 300.—LAMK., *Dict.*, Suppl., ii. 500; *Ill.*, t. 51.—DC., *Prodr.*, iv. 63.—A. S. H., in *Mém. Mus.*, ii. 119.—ENDL., *Gen.*, n. 4630.—B. H., *Gen.*, 634, n. 1.

3 HOOK., *Icon.*, t. 16.—RÉM., in *C. Gay Fl. Chil.*, iii. 39.—HOOK. F., *Fl. Antarct.*, ii. 281; *Fl. Nov.-Zel.*, i. 80, t. 20.—BENTH., *Fl. Austral.*, ii. 450.

They are little cæspitose-tufted herbs, with the habit of certain alpine Saxifrages, and possess little imbricated, alternate coriaceous leaves, and sessile solitary terminal flowers, sometimes asexual by abortion.[1]

II. PENTHORUM SERIES.

Penthorum (figs. 376, 377),[2] a genus hitherto generally referred to *Crassulaceæ*, has regular hermaphrodite apetalous flowers, hexamerous or more frequently pentamerous. In the latter is a concave disk, thick and saucer-shaped, on the rim of which are inserted the perianth and androceum. The former consists of five or six short somewhat unequal sepals, valvate, or nearly so, in the bud. The petals are absent or ill-developed. There are twice as many stamens, half of them shorter, and alternating with the sepals, the other half superposed to them; each consists of a short slender filament, and a basifixed two-celled anther, dehiscing by two introrse or submarginal longitudinal clefts. The hollow of the receptacle forms a frame to the lower part of the five radiating carpels, which are applied to its walls and leave a depression in the centre. They alternate with the sepals; each consists of a one-celled ovary tapering above into a style, slightly dilated and stigmatiferous at the apex. In the ventral angle of each ovary is a large ovoid stigma, covered with numerous little anatropous ovules. The fruit, surrounded by the persistent calyx, consists of five capsules, the free part of which separates from that adherent to the receptacle, setting free the numerous seeds. These are rugose or papillose, with an axile cylindroidal embryo,

Penthorum sedoides.

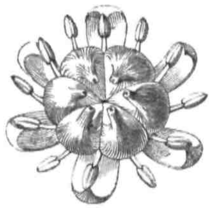

FIG. 376.
Flower ($\frac{4}{1}$).

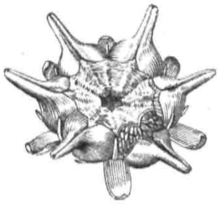

FIG. 377.
Fruit dehiscing.

[1] Only with doubt do we refer the genus *Donatia* to this order. "*Gen. valde anomalum.*" (B. H., *loc. cit.*)

[2] L., *Gen.*, n. 580.—ADANS., *Fam. des Pl.*, ii. 245.—J., *Gen.*, 308.—GÆRTN., *Fruct.*, i. 312, t. 65.—LAMK., *Dict.*, v. 160; Suppl., iv. 351; *Ill.*, t. 390.—DC., *Prodr.*, iii. 414; *Mém. Pl. Gr.*, ii. 43, t. 1, fig. 8, t. 13.—ENDL., *Gen.*, n. 4625.—B. H., *Gen.*, 661, n. 13.

surrounded by thin fleshy albumen. Two species of *Penthorum* are known,[1] one Chinese, the other from the north-west of America. They are perennial herbs, with erect stems and alternate, simple, elongated, membranous-petiolate leaves. The flowers are small and greenish, and form branching cymes, uniparous and scorpoid towards the apex, terminating the branches.

III. CEPHALOTUS SERIES.

The flowers of the genus *Vami* or *Cephalotus*[2] (figs. 378–381), are regular, hermaphrodite, and monochlamydeous. The receptacle is a shallow cup, lined by a layer of glandular tissue, studded with papillæ and little glandular hairs. On its rim are inserted the six triangular petaloid leaves[3] of the perianth. The androceum is diplostemonous, consisting of six stamens alternate with the perianth-leaves, and six smaller ones superposed to them. All are perigynous, and inserted on the rim of the disk; they consist of a free filament, and a didymous, introrse, two-celled anther, whose connective is thickened into a swollen, fleshy, cellular, dorsal process. The gynæceum is inserted not far from the centre of the receptacle;[4] it is formed of six free carpels, alternating with the perianth-leaves; each is formed of a one-celled ovary, tapering into a recurved style, stigmatiferous at the tip. In the ventral angle of each ovary, close to its base, is inserted by a short-curved funicle, the single ascending anatropous ovule,[5] with its raphe dorsal, and its micropyle looking downwards and inwards. The fruit is formed of six shortly stipitate follicles, around which persist the receptacle and perianth.

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[1] TORR. & GR., *Fl. N.-Amer.*, i. 561.—A. GRAY, *Man.*, ed. 2, 141.—CHAPM., *Fl. S. Unit. States*, 150.

[2] LABILL., *Pl. Nouv.-Holl.*, ii. 7, t. 145.—R. BR., in *Flind. Voy.*, ii. 601, t. 4; in *Edinb. Phil. Mag.* (1832), 314.—LAMK., *Dict.*, viii. 326.—ENDL., *Gen.*, n. 4628.—AG., *Theor. Syst. Pl.*, 360.—B. H., *Gen.*, 655, n. 73.—H. BN., in *Adansonia*, vi. 3.

[3] They are greenish-white, and perhaps represent a corolla. Without having seen the perianth at its first origin, we have seen it very young, and then its leaves were all of the same size, as in a corolla. Moreover, the large stamens alternate with them (fig. 388), and are thus in the position they occupy to the petals of other diplostemonous *Saxifragaceæ*.

[4] Between the carpels the receptacle rises up like the bottom of a wine bottle, projecting into a little cone with an obtuse apex, inconspicuous at maturity. R. BROWN, in his figures of *Cephalotus*, is wrong in drawing the carpels sometimes in front of the perianth-leaves, sometimes alternate with them.

[5] It is said that there are sometimes two ovules; they have two coats.

This support finally opens and gapes widely, revealing the follicles covered with long reflexed hairs. They are surmounted by the recurved, hooked, persistent style, and open along the ventral angle.

Cephalotus follicularis.

FIG. 378.
Habit ($\frac{1}{2}$).

FIG. 379.
Flower ($\frac{4}{1}$).

FIG. 380.
Diagram.

FIG. 381.
Long. sect. of flower.

The seed is elliptical-oblong, with a pale, lax, membranous, outer coat; the fleshy albumen contains near its base a little axile embryo. *C. follicularis*,[1] the only known species, is a perennial herb, from the

[1] LABILL., *loc. cit.*—HOOK., in *Bot. Mag.*, t. 3118, 3119.—NEES, in *Pl. Preiss.*, i. 278.—BENTH., *Fl. Austral.*, ii. 449.—LEM. & DCNE., *Tr. Gén.*, 266.

marshlands of the South-west of Australia, with the habit of certain Saxifrages. Its short rhizome, sunk vertically, or more or less obliquely in the swampy soil, bears above ground the alternate, so-called radical leaves, petiolate and exstipulate, approximated into a rosette. Some of them are entire, flat, elliptical-oblong, without marked ribs; others are developed into pitchers or ascidia (fig. 378); in these the petiole bears at its apex a suspended urn, with three longitudinal, external prominences, one median and two lateral; a thick collar covered with vertical ribs surrounds the mouth of the urn,[1] closed by a slightly convex lid. All the parts of this plant are covered with a fine silky down. The flowers are borne on a common erect scape, naked below, and bearing above a pretty large number of alternate, usually biparous cymes, with bracts at their base, but no bractlets to the floral pedicels.

IV. PARNASSIA SERIES.

Parnassia[2] (figs. 382–387) has regular hermaphrodite flowers. The receptacle is slightly concave and saucer-shaped; on its rim are inserted the perianth and androceum. The calyx consists of five sepals, one anterior, two lateral, and two posterior, of imbricate præfloration.[3] The corolla consists of five imbricated marcescent petals.[4] The five subperigynous stamens alternate with the petals; each consists of a free filament, and an introrse, versatile, two-celled anther of longitudinal dehiscence.[5] Between the stamens are as many multifid scales (fig. 385), with slender subulate lobes, each tipped by a capitate gland. The gynæceum is free; its one-celled ovary is surmounted by a short style, which at once divides into three, or more frequently four, stigmatiferous branches. To these are superposed as many parietal placentas,[6] which bear either all

[1] DUCHTRE., *Elém. de Bot.*, figs. 111, 112.

[2] *Parnassia* T., *Inst.*, 246, t. 127.—L., *Gen.*, n. 384.—ADANS., *Fam. des Pl.*, ii. 449.—J., *Gen.*, 245.—GÆRTN., *Fruct.*, i. 287, t. 60.—LAMK., *Dict.*, v. 22; Suppl., iv. 302; *Ill.*, t. 216.—DC., *Prodr.*, i. 320.—ENDL., *Gen.*, n. 5039.—PAYER, *Organog.*, 183, t. 39; *Fam. Nat.*, 101.—A. GRAY, *Gen. Ill.*, t. 86.—B. H., *Gen.*, 639, 1004, n. 19.—H. BN., in *Adansonia*, vi. 7.—LEM. & DCNE., *Tr. Gén.*, 406.—*Enneadynamis* GESN. (ex ADANS.)—*Pyrola* MOR. (ex ADANS., nec *alior.*).

[3] The imbrication is peculiar in *P. palustris* (fig. 384). Here it is quincuncial, but most commonly with sepals 1 and 4 posterior, and sepals 2 and 3 lateral.

[4] Sometimes fimbriate.

[5] The pollen grains are ovoidal, with three folds; in water they become spherical, with three papillate bands (H. MOHL, in *Ann. Sc. Nat.*, ser. 2, iii. 329).

[6] When there are four, two of the incomplete cells are lateral, two antero-posterior.

along or only below, an indefinite number of pluriseriate, oblique or transverse, anatropous ovules.[1] The fruit, at whose base persists the withered perianth, is a capsule, opening above into three or four

Parnassia palustris (*Grass of Parnassus*).

FIG. 383.
Flower.

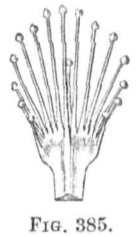

FIG. 385.
Glanduliferous scale ($\frac{3}{1}$).

FIG. 386.
Fruit.

FIG. 384.
Diagram.

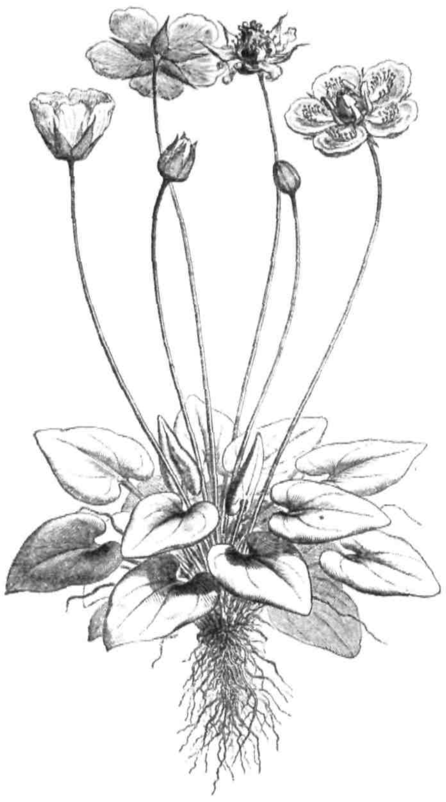

FIG. 382
Habit ($\frac{1}{2}$).

FIG. 387.
Seed.

valves, each bearing on the centre of its inner face a many-seeded placenta. The seeds (fig. 387) have a lax cellular external coat, in which lies loosely the internal mass. This contains a fleshy cylind-

[1] They have two coats, very distinct towards the micropyle.

roidal embryo, sometimes surrounded by a membranous albumen. *Parnassia* comprises about a dozen species of glabrous perennial herbs,[1] inhabiting the temperate and cold regions of the Northern Hemisphere, and the mountains of India, preferring marshes and damp pastures. The radical leaves are alternate, with a petiole dilated at the base, and a simple blade. Axillary to these arise one-flowered peduncles, bearing halfway up one or more leaves or bracts.

V. FRANCOA SERIES.

Francoa[2] (figs. 388–391) has hermaphrodite regular flowers. On the rim of the very slightly concave receptacle are inserted four sepals, valvate or slightly imbricate, two lateral, two antero-posterior. There are as many alternating petals, imbricate or contorted in the bud.

Francoa sonchifolia.

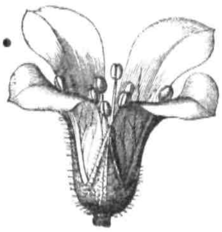

FIG. 388. Flower $(\frac{2}{1})$.

FIG. 389. Diagram.

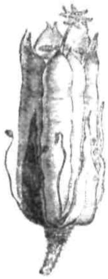

FIG. 391. Fruit dehiscing $(\frac{2}{1})$.

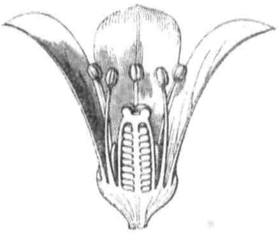

FIG. 390. Long. sect. of flower.

The androceum consists of eight subperigynous stamens, four superposed to the sepals, and four smaller to the petals; each consists

[1] VENT., *Malm.*, t. 39.—HOOK., *Fl. Bor.-Amer.*, i. t. 27, 28; *Bot. Misc.*, i. t. 23.—ZENK., *Pl. Ind.*, t. 5.—K., *Fl. Berol.*, i. 99.—GREN. & GODR., *Fl. de Fr.*, i. 193.—ARN., in *Bot. Mag. Comp.*, ii. 315.—WIGHT, *Ill.*, t. 21; *Icon.*, t. 945.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 79.—WALP., *Rep.*, i. 230; ii. 768; *Ann.*, i. 72, 958.

[2] CAV., in *Ann. Scienc. Nat.*, iv. 237; *Icon.*, vi. 77, t. 596.—DC., *Prodr.*, vii. 777.—A. JUSS., in *Ann. Sc. Nat.*, sér. 1, iii. 192, t. 12; in *Dict. d'Hist. Nat.*, vii. 35.—ENDL., *Gen.*, n. 4626.—SPACH, *Suit. à Buffon*, v. 68.—PAYER, *Organog.*, 374, t. 82.—B. H., *Gen.*, 640, n. 20.—H. BN., in *Payer Fam. Nat.*, 388.—*Liaupanke* FEUILL., *Journ.*, ii. 742, t. 31.

of a free filament and a two-celled anther dehiscing by two sublateral longitudinal clefts. Between the stamens are eight elongated glands. The free gynæceum consists of an ovary with four prominent cells superposed to the petals, each containing a large number of anatropous ovules. It is surmounted by a short style, which soon expands into a sort of four-lobed stigmatiferous cup, the lobes alternating with the cells of the ovary. The fruit, around whose base is the persistent calyx, is an elongated tetragonal septicidal capsule, dehiscing from the summit downwards, with concave valves bearing the polyspermous septa on the centre of their inner face, while the style persists, dried up on top of the central columella (fig. 391). The seeds have a lax membranous outer coat, and contain a fleshy albumen lodging a small embryo at its apex. There are two species of *Francoa*,[1] perennial Chilian herbs. Their leaves are alternate, lyrate-pinnatifid,[2] tapering at the base to simulate a winged petiole, though really sessile, exstipulate, and often sprinkled with glands. Their flowers form simple or compound racemes, and are each axillary to a bract, more or less adnate to the pedicel in one of the species.

Tetilla hydrocotylæfolia,[3] a perennial herb from Chili, is formed as in *Francoa;* but its perianth is irregular; its posterior sepals are larger than the anterior; and its anterior petals are either quite absent, or usually smaller than the posterior. The fruit is a many-seeded membranous loculicidal capsule; the flowers are racemose.

VI. HYDRANGEA SERIES.

Hydrangea[4] (figs. 392, 393) has its flowers all fertile, or of two kinds, the outermost of the inflorescence remaining sterile, with only

[1] DON, in *Edinb. N. Phil. Journ.*, vi. 51.—KZE., in *Flora* (1831), 369.—SWEET, *Fl. Gard.*, ii. t. 151.—LINDL., in *Bot. Reg.*, t. 1645.—HOOK., in *Bot. Mag.*, t. 3178, 3309.—C. GAY, *Fl. Chil.*, iii. 147.—LEM. & DECNE., *Trait. Gén.*, 265.—WALP., *Ann.*, vii. 902.

[2] Not really compound.

[3] DC., *Prodr.*, iv. 667; vii. 778.—DELESS., *Ic. Sel.*, iii. t. 77.—PŒPP. & ENDL., *Nov. Gen. et Spec.*, i. t. 19.—A. JUSS., *loc. cit.*—C. GAY, *Fl. Chil.*, iii. 149.—ENDL., *Gen.*, n. 4627.—*Dimorphopetalum Tetilla* BERT., in *Merc. Chil.* (1829), n. 12–14.—*Tetraplasium* KZE., in *Flora* (1831), 378.

[4] L., *Gen.*, n. 557 (*Hydrangia*).—J., *Gen.*, 214.—GÆRTN., *Fruct.*, i. 150, t. 30.—LAMK., *Dict.*, iii. 150; Suppl., iii. 71; *Ill.*, t. 170.—DC., *Prodr.*, iv. 13.—SPACH, *Suit. à Buffon*, v.

rudiments of the sexual organs and corolla. To make up for this the calyx is enormously developed, formed of four or five large coloured veined petaloid sepals. In the fertile flowers it is short, consisting of four or five little tooth-like sepals, inserted on the rim of the receptacu-

Hydrangea quercifolia.

FIG. 392.
Flowering branch ($\frac{1}{3}$).

FIG. 393.
Flowers, sterile and fertile.

lar sac. When its parts are large enough they are imbricate in the bud. The petals, inserted like the sepals, are alternate with them, free, and valvate in the bud. The stamens are what is termed epigynous, inserted outside a glandular disk surmounting the ovary. Four or five are superposed to the sepals, and as many to the petals. Their filaments are free and bear short two-celled anthers dehiscing by introrse or marginal longitudinal clefts.[1] The ovary, sunk in the concavity of the receptacle, only springs from it towards its apex, surmounted by a style with two or four branches; these are stigmatiferous above or inside their extremities. There are as many parietal placentas, which often meet and unite along the axis of the

21.—ENDL., *Gen.*, n. 4668.—PAYER, *Fam. Nat.*, 87.—B. H., *Gen.*, 640, n. 22.—H. BN., in *Adansonia*, i. 374; vi. 11.—LEM. & DECNE., *Tr. Gén.*, 263. — *Peautia* COMMERS., mss. — *Hortensia* COMMERS. (ex J., *loc. cit.*).—LAMK., *Dict.*, iii. 136; Suppl., iii. 59; *Ill.*, t. 380.—*Primula* LOUR., *Fl. Cochinch.*, 127 (nec *Auctt.*).—*Cornidia* R. & PAV., *Prod.* 52, t. 35; *Fl. Per. et Chil.*, iv. t. 335 (ined.).—ENDL., *Gen.*, n. 4671.—*Sarcostyles* PRESL, *Rel. Hænk.*, ii. 53, t. 60.

[1] The pollen grains are small and ellipsoidal in *H. radiata* and in *Hortensia speciosa*, another species of this genus. When moistened they become ovoidal, with three bands. (H. MOHL, in *Ann. Sc. Nat.*, sér. 2, iii. 331.)

ovary, which thus becomes two- or four-celled. The ovules are numerous, small and anatropous.[1] The fruit is dry and capsular, often submembranous, surmounted by the teeth of the calyx and the two or four withered styles; between these it opens at the apex to free the numerous seeds. The outer seed-coat is often prolonged into a reticulate membranous sac; the thin fleshy albumen contains in its axis a cylindrical embryo with very short cotyledons. Some thirty species of this genus are known,[2] inhabitants of the temperate parts of North and South America, East and Central Asia, and Java. They are trees or shrubs, sometimes sarmentose, with opposite petiolate exstipulate leaves, persistent or caducous. The inflorescences are terminal, with caducous bracts at the base. They look like corymbs, but are really short ramified racemes of cymes, which often become uniparous peripherally, towards the sterile flowers with the large petaloid calyx (fig. 393).

A Japanese *Hydrangea* has been described as a distinct species under the name of *Schizophragma*;[3] its styles, instead of being free all along or for some distance, are united into a single column, right up to the four- or five-lobed stigmatiferous end. This character appears to us of only sectional value.

Platycrater[4] has the characters of *Hydrangea* with numerous stamens, and is to that genus what *Philadelphus* is to *Deutzia*. The flowers may be tetramerous or pentamerous; but the carpels, with the styles and parietal placentas, are usually two or more rarely three in number. The latter number is found in *Cardiandra*,[5] which is generically inseparable from *Platycrater*, though possessing alternate leaves. The two known species[6] of this genus are Japanese shrubs, with the habit, inflorescence, and external sterile flowers of *Hydrangea*.

Pileostegia[7] has tetramerous flowers, very near those of some *Hyd-*

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[1] They have two coats.

[2] DUHAM., *Arbr.*, ed. nov. iii. t. 24.—WALL., *Tent. Fl. Nepal.*, t. 49, 50.—CURT., in *Syll. Pl.*, ii. 38.—SIEB. & ZUCC., *Fl. Jap.*, t. 51–64, 92.—PŒPP. & ENDL., *Nov. Gen. et Spec.*, i. 10, t. 17 (*Cornidia*).—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 75.—A. GRAY, *Man.*, ed. 2, 146.—CHAPM., *Fl. S. Unit. States*, 155.—*Bot. Mag.* t. 437, 975, 4253, 5038.—WALP., *Rep.*, ii. 375 377 (*Cornidia*); *Ann.*, ii. 689; vii. 902.

[3] SIEB. & ZUCC., *Fl. Jap.*, 58, t. 26.—ENDL., *Gen.*, n. 4670.—B. H., *Gen.*, 641, n. 23.—WALP., *Rep.*, v. 836.

[4] SIEB. & ZUCC., *Fl. Jap.*, 62, t. 27.—ENDL., *Gen.*, n. 4669.—B. H., *Gen.*, 642, n. 30.

[5] SIEB. & ZUCC., *op. cit.*, 119, t. 65, 66.—ENDL., *Gen.*, n. 4668 [1].—B. H., *Gen.*, 643, n. 31.

[6] WALP., *Rep.*, v. 835, 836.

[7] HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 57, 76, t. 2.—B. H., *Gen.*, 641, n. 24.

rangeas, especially those that possess a single style with a thick and more or less angular or lobed stigmatiferous head. But the valvate corolla is circumcissile, coming off at the base in a single piece. The fruit is a capsule with four or five many-seeded cells. This small genus comprises one or two Asiatic species, with opposite exstipulate leaves, and small flowers in compound branching racemes.

Broussaisia,[1] with the floral organization of *Pileostegia*, has a baccate fruit and polygamous flowers. Their single style is dilated above into a five-lobed stigmatiferous head. *Dichroa*[2] has a fleshy fruit, but from three to five distinct styles. The petals are well developed and valvate. One species of *Dichroa* is known, a native of the temperate regions of India, China, Java, and the Philippines,[3] with alternate leaves, and flowers that change colour from blue to pinky lilac. The only known species[4] of *Broussaisia* has opposite leaves, and inhabits the Sandwich Islands.

VII. PHILADELPHUS SERIES.

We shall commence the study of this order with the genus *Deutzia*[5] (figs. 394–396), which has regular hermaphrodite flowers. The hollow receptacle, saccate or obconical, bears on its rim five valvate sepals, and five alternating petals of imbricate or valvate-induplicate æstivation. At the same height are inserted, more internally, ten stamens, five superposed to the sepals, and five shorter to the petals. Their filaments are large and subpetaloid, and divide above into

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1 GAUDICH., in *Voy. Freycin., Bot.*, 479, t. 69; *Voy. Bonite, Bot.*, t. 9.—DC., *Prodr.*, iv. 17.—ENDL., *Gen.*, n. 4673.—A. GRAY, *Bot. Unit. States Expl. Exp.*, i. 681, t. 87.—B. H., *Gen.*, 641, n. 26.

2 LOUR., *Fl. Cochinch.*, 301.—ENDL., *Gen.*, n. 6882.—B. H., *Gen.*, 641, n. 25.—*Cyanitis* REINW., *Syll. Pl. Ratisb.*, ii. 10.—*Adamia* WALL., *Tent. Fl. Nepal.*, 46, t. 36; *Pl. As. Rar.*, t. 213.—SPACH, *Suit. à Buffon*, v. 28.—ENDL., *Gen.*, n. 4672.

3 *D. febrifuga* LOUR., *loc. cit.*—BENTH., *Fl. Hongkong.*, 128.—WALP., *Ann.*, vii. 903.—*Adamia versicolor* WALL., *loc. cit.*—*Bot. Mag.* t. 3046.

4 *B. pellucida* GAUDICH. (*Voy. Bonite, loc. cit.*) has been described as a distinct species of *B. arguta* GAUDICH. (*Voy. Freycin., loc. cit.*;—A. GRAY, *loc. cit.*, 683), but it may well be only a form with somewhat different leaves; still A. GRAY retains the two as distinct species.

5 THUNB., *Nov. Gen.*, 19; *Fl. Jap.*, 10, t. 24.—J., *Gen.*, 431.—GÆRTN., *Fruct.*, iii. 30, t. 184.—LAMK., *Dict.*, ii. 275; Suppl., ii. 467; *Ill.* t. 380.—DC., *Prodr.*, iv. 16.—SPACH, *Suit. à Buffon*, v. 18.—ENDL., *Gen.*, n. 6107.—PAYER, *Organog.*, 377.—B. H., *Gen.*, 642, n. 27.—H. BN., in *Payer Fam. Nat.*, 347.

three teeth, of which the central is much the longest and bears an introrse two-celled anther of longitudinal dehiscence. The ovary,

Deutzia scabra.

FIG. 394. Flower.

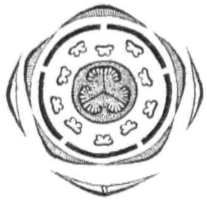

FIG. 395. Diagram.

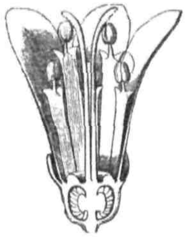

FIG. 396. Long. sect. of flower.

lodged inside the receptacle and covered with a glandular disk, is divided into three or four cells, surmounted by as many styles stigmatiferous at the apex. In the ventral angle of each is a thick placenta covered with anatropous ovules. The fruit is a septicidal capsule opening above into three or four valves. The seeds are numerous and oblique; the membranous outer coat is prolonged above into a wing, below into a sort of tube. In the centre is an embryo surrounded by fleshy albumen. *Deutzia* comprises six or seven species[1] of shrubs from Temperate India, China, and Japan. Their leaves are opposite, simple, serrate, exstipulate, often covered with simple or stellate hairs. The flowers are grouped into simple or compound spikes or racemes, axillary or terminal, with opposite bracts; more rarely they are solitary in the axils of the leaves.

Philadelphus (the Syringa[2] of our gardeners; figs. 397–403), may be defined as *Deutzia* with flowers more frequently tetramerous than pentamerous, a twisted corolla, and numerous stamens in four bundles superposed to the sepals. The filaments have no lateral

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[1] DON, in *Edin. N. Phil. Journ.*, iii. (1829), 164.—WALL., *Pl. As. Rar.*, t. 191.—ROYLE, *Ill. Himal.*, t. 46.—SIEB. & ZUCC., *Fl. Jap.*, t. 6–8; in *Ann. Sc. Nat.*, sér. 2, vi. 80.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 83.—*Bot. Reg.*, t. 1718; (1840), t. 5; (1847), t. 13.—WALP., *Rep.*, ii. 151; *Ann.*, vii. 903.

[2] *Philadelphus* L., *Gen.*, n. 614.—J., *Gen.*, 325.—GÆRTN., *Fruct.*, i. 173, t. 35.—LAMK. *Dict.*, vii. 118; Suppl., v. 135; *Ill.*, t. 420.—DC., *Prodr.*, iii. 205.—SPACH, *Suit. à Buffon*, v. 13.—ENDL., *Gen.*, n. 6105.—PAYER, *Organog.*, 377, t. 83.—B. H., *Gen.*, 642, n. 29.—H. BN., in *Payer Fam. Nat.*, 348; in *Adansonia*, vi. 1, 11.—*Syringa* T., *Inst.*, 617, t. 389 (nec L.).

teeth. The ovary has either three cells, or as many as there are petals superposed to them. The capsular fruit (fig. 401) is loculicidal, with its valves entire or bifid at the apex; the seeds (figs. 402, 403), re-

Philadelphus coronarius.

FIG. 397.
Flowering branch.

FIG. 398.
Flower.

FIG. 400.
Long. sect. of fruit ($\frac{2}{1}$).

FIG. 399.
Diagram.

sembling those of *Deutzia*, are prolonged into a narrow wing at either end. This genus comprises shrubs from the temperate regions of Europe, middle Asia, and North America, possessing the vegetative organs and inflorescence of *Deutzia*. Some ten or twelve

species[1] have been distinguished; most of them are cultivated in our gardens.

Philadelphus coronarius.

FIG. 402.
Seed ($\frac{6}{1}$).

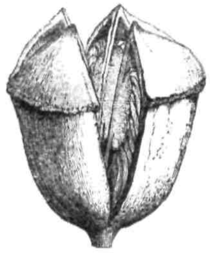

FIG. 401.
Fruit dehiscing ($\frac{3}{1}$).

FIG. 403.
Long. sect. of seed.

Decumaria barbara.

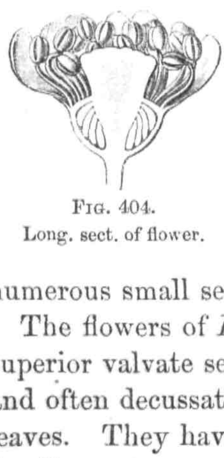

FIG. 404.
Long. sect. of flower.

Decumaria (fig. 404)[2] is a sarmentose shrub from North America, with the leaves of *Philadelphus*; but its flowers, of fundamentally the same organization, are formed on the type 7 or 8, or even 9 or 10. They are grouped into a ramified corymbiform terminal cyme. The fruits are dry and many-seeded; but they open as in several *Escallonias*, so that the external and internal layers of the pericarp separate from the netted veins of the mesocarp. Within this network are seen the numerous small seeds, formed nearly as in *Philadelphus*.

The flowers of *Fendlera* come very near those of *Deutzia*,[3] with four superior valvate sepals, four alternate unguiculate petals, imbricated and often decussate, and eight stamens superposed to the perianth-leaves. They have an introrse anther, cuspidate at the apex; and the filament expands above into two large alate petaloid lateral lobes which overtop the anther. The ovary is partly inferior, surmounted

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[1] ROYLE, *Ill. Himal.*, t. 46.—A. GRAY, *Man.*, ed. 2, 146.—CHAPM., *Fl. S. Unit. St.*, 156.—*Bot. Mag.*, t. 1478, 5334.—*Bot. Reg.*, t. 2003; (1838), t. 14; (1839), t. 32, 39; (1842), t. 38.—WALP., *Rep.*, ii. 151; *Ann.*, ii. 614; iv. 821; vii. 903.

[2] L., *Gen.*, 597.—J., *Gen.*, 324.—LAMK., *Dict.*, ii. 265; Suppl., ii. 459; *Ill.*, t. 403.—DC., *Prodr.*, iii. 205.—SPACH, *Suit. à Buffon*, v. 19.—ENDL., *Gen.*, n. 6106.—H. BN., in *Payer Fam. Nat.*, 348.—B. H., *Gen.*, 642, n. 28.—*D. sarmentosa* BOSC., in *Act. Soc. Hist. Nat. Par.*, i. 76, t. 13.—*D. Forsythia* MICHX., *Fl. Bor.-Amer.*, i. 282.—*D. radicans* MŒNCH.—*Forsythia scandens* WALT., *Carol.*, 154.

[3] ENGELM. & A. GRAY, in *Pl. Wright.*, i. (*Smithson. Contrib.*, iii.), 77, t. 5.—H. BN., in *Adansonia*, vi. 2.—B. H., *Gen.*, 643, n. 33.

by a style, deeply divided into four linear lobes, which however long remain sticking together into an apparently single column. They are stigmatiferous at the apex. There are four cells superposed to the petals, each with an axile placenta bearing a variable number of descending ovules. The fruit is a partly superior septicidal capsule, containing descending seeds like those of *Philadelphus*, with the embryo surrounded by fleshy albumen. The only known species[1] of this genus is a shrub from Texas and New Mexico, with opposite leaves and terminal flowers, solitary or few together.

Jamesia americana[2] is also a closely allied plant with pentamerous diplostemonous flowers. Its ovary is in great part superior, 1-celled, with three or five oppositipetalous stylar branches, and as many alternating multiovulate placentas, T-shaped in transverse section. The fruit is a capsule, with the calyx persisting at its base; it opens at the apex between the styles to free the numerous albuminous seeds. This plant is a shrub from the Rocky Mountains, with opposite exstipulate leaves, and flowers in ramified terminal racemes.

Near these, botanists have placed *Carpenteria californica*,[3] a shrub with opposite leaves, and few terminal cymose 5–7-merous flowers. The receptacle is shallow, the calyx valvate, the corolla twisted, the indefinite stamens perigynous. The ovary, to a great extent superior, has from five to seven cells, into the ventral angle of which project two large placentary lobes covered with the numerous small ovules. It becomes a loculicidal capsule with albuminous seeds, like those of the preceding genera.

Whipplea modesta,[4] a low Californian undershrub, has small flowers with a concave receptacle lodging part of the ovary, and bearing on its rim from four to six sepals, as many petals, and twice as many free stamens with didymous anthers, those opposite to the petals being the smaller. The partly inferior ovary has four or five cells, each containing a descending ovule attached close to the apex of the

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[1] *F. rupicola* ENGELM. & A. GRAY, *loc. cit.*—WALP., *Ann.*, iv. 820.

[2] TORR. & GRAY, *Fl. N.-Amer.*, i. 593.—ENDL., *Gen.*, n. 4670 [1].—H. BN., in *Adansonia*, vi. 2.—B. H., *Gen.*, 643, n. 32.—WALP., *Ann.*, ii. 614.

[3] TORR., *Pl. Fremont.*, 12, t. 7.—B. H., *Gen.* 643, n. 34.—WALP., *Ann.*, iv. 820.

[4] TORR., in *Wipp'. Exped., Bot.*, 34, t. 7.—B. H., *Gen.*, 644, n. 35.

ventral angle. It is surmounted by a style with as many linear branches, stigmatiferous inside. The fruit is a capsule, with the receptacle surrounding its base; it divides above into several one-seeded stones which open ventrally. The slender scabrous branches of this plant are covered with opposite simple oval dentate leaves, petiolate, three-ribbed at the base, and exstipulate. The flowers are grouped in little terminal racemes.[1]

Pterostemon mexicanus,[2] formerly classed with doubt among *Rosaceæ*,[3] must now, as we have since discovered,[4] be regarded as allied to *Deutzia* and *Jamesia*, at the same time presenting points of strong resemblance with *Escallonia*. Its leaves are indeed alternate; but they possess very small stipules, and it has ten stamens; but the alternipetalous alone have a flattened trifid filament, with the anther on the middle tooth; the five others are reduced to sterile tongues. The capsular fruit dehisces as in *Philadelphus*, and contains wingless seeds, whose axile embryo is surrounded by fleshy albumen. The only known species has its flowers in corymbiform cymes, like those of the Service-trees, and sometimes reduced to very few flowers.

VIII. ESCALLONIA SERIES.

Escallonia[5] (figs. 405–408) has regular hermaphrodite flowers. In its saccate receptacle is embedded the ovary, crowned with an epigynous disk traversed by the base of the style. On the rim of the receptacle are inserted five sepals, free or united below, valvate or quincuncial in the bud. The corolla is formed of five alternate petals, free, but so applied to one another below as to form a sort of tube, and imbricated or rarely twisted in præfloration. The five stamens, alternate with the petals, are inserted like them outside

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[1] This plant appears to represent a *Decumaria* of reduced type, with its ovary-cells containing but a single ovule.

[2] SCHAUER, in *Linnæa*, xx. 736.

[3] See above, i. 389, 461, n. 36.

[4] In *Adansonia*, ix. 245.

[5] L. FIL., *Suppl.*, 21.—J., *Gen.*, 321.—GÆRTN., *Fruct.*, iii. 16, 182.—LAMK., *Dict.*, ii. 394; Suppl., v. 246; *Ill.*, t. 143.—DC., *Prodr.*, iv. 2.—SPACH, *Suit. à Buffon*, v. 29.—ENDL. *Gen.*, n. 4674.—PAYER, *Organog.*, 385, t. 89.—H. BN., in *Adansonia*, v. 283; vi. 9.—B. H., *Gen.*, 644, n. 36.—LEM. & DECNE., *Tr. Gén.*, 263.—*Stereoxylon* R. & PAV., *Prodr.*, 38, t. 6; *Fl. Per. et Chil.*, t. 234, 238.—*Mollia* GMEL., *Syst.*, 303 (nec MART. & ZUCC.).—*Vigiera* VELLOZ, *Fl. Flum.*, ii. t. 73, 74.

the margin of the disk; they have free filaments, often sticking to the edges of the petals, and introrse two-celled anthers of longitudinal dehiscence. The inferior ovary contains two, or more rarely three cells, complete or nearly so,[1] and containing in the ventral angle the

Escallonia rubra.

Fig. 405.
Flowering branch.

large 2-lobed placentas, covered with anatropous ovules. The stigmatiferous head of the single style is divided into two or three lobes, often ill-defined. This style persists with the disk and calyx at the top of the fruit, which is a septicidal two or three-celled capsule, opening at the base into two or three valves, while the placentas are left covered with the indefinite small seeds, whose coats[2] contain a fleshy albumen enfolding an axile embryo. *Escallonia* consists of some thirty species[3] of American trees or shrubs, often glandular,

[1] Very often the placentas touch by the inner edge of their two rounded lobes (fig. 407), but they may be usually separated by slight traction.

[2] The outer coat usually forms a lax furrowed membranous bag, sometimes prolonged at the base into a sort of cellular fringe.

[3] H. B. K., *Nov. Gen. et Spec.*, iii. 294.—Vent., *Ch. de Pl.*, t. 54.—Reichb., *Ic. Exot.*,

viscid and resinous. Their flowers[1] are rarely axillary, usually collected into terminal cymes forming false racemes or corymbs.

Valdivia Gayana[2] is a little Chilian shrub, whose flower scarcely differs from that of *Escallonia*.[3] Its parts may be in sixes or

Escallonia rubra.

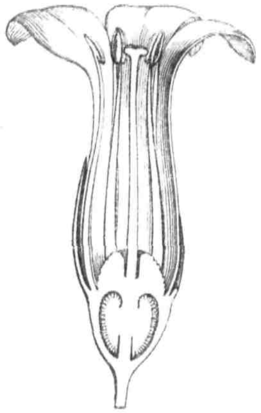

FIG. 406.
Flower.

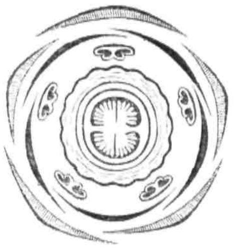

FIG. 407.
Diagram.

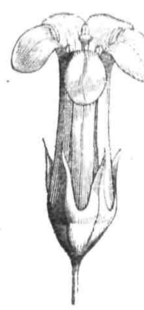

FIG. 408.
Long. sect. of flower ($\frac{2}{1}$).

sevens, while the gynæceum is di- or trimerous.[4] Each petal bears inside and near its base a tuft of hairs; and the dry membranous fruit is perhaps indehiscent. The habit is very peculiar: the very humble stem bears large obovate-lanceolate leaves, with glandular teeth. The flowers form axillary racemes.

In *Quintina*[5] the flowers are those of *Escallonia* and *Valdivia*, but smaller. The ovary is however only partly inferior, and contains from three to five cells, complete or incomplete. The fruit is capsular, and opens between the carpels to free the numerous winged seeds. The genus comprises shrubs with alternate simple exstipulate leaves, and

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t. 202.—PRESL, *Rel. Hænk.*, ii. t. 51–59.—A. S. H., *Fl. Bras. Mer.*, ii. t. 51–59.—PŒPP. & ENDL., *Nov. Gen. et Spec.*, i. 8, t. 13–15.—LINK & OTT., *Ic. Sel.*, t. 23.—RÉMY, in *C. Gay Fl. Chil.*, iii. 49.—WEDD., *Chl. Andin.*, ii. 208, t. 71 B.—HOOK., *Icon.*, t. 114, 514, 540.—*Bot. Reg.*, t. 1467, 1900.—*Bot. Mag.*, t. 2890, 4473, 4827.—WALP., *Rep.*, ii. 377; v. 837; *Ann.*, i. 338, 976; v. 32; vii. 905.

[1] White, pink, or red.

[2] RÉMY, in *C. Gay Fl. Chil.*, iii. 43, t. 29.—B. H., *Gen.*, 644, n. 37.—WALP., *Ann.*, i. 976.

[3] The petals are valvate.

[4] If there are two placentas, they touch when adult, and the ovary is two-celled; but when young they easily separate from one another.

[5] A. DC., *Monogr. Campanulac.*, 92; *Prodr.*, iv. 5.—ENDL., in *Flora* (1832), 389, t. 3; *Atakt.*, t. 10; *Gen.*, n. 4675.—B. H., *Gen.*, 645, n. 38.

flowers in simple or ramified racemes. The four or five known species[1] inhabit Australia and New Zealand.

Forgesia borbonica[2] is a shrub, with flowers formed as in *Escallonia* except in two points: the petals, slightly united at the base, are valvate, not imbricate; and the two styles are free, not united.[3] The fruit, partially inferior, is a septicidal capsule.[4] All the parts of this shrub are glabrous. The leaves are alternate, petiolate, exstipulate, simple, lanceolate. The flowers form pretty large lax terminal racemes of cymes.

The flowers of *Argophyllum*[5] are regular and hermaphrodite, with the receptacle subconcave or very deep,[6] so that the insertion of the perianth and androceum is subhypogynous or perigynous, according to the species. There are five or six sepals, and as many alternating petals, both sets valvate in the bud. The stamens of the isostemonous androceum have a small free filament, and an introrse two-celled anther[7] of longitudinal dehiscence. The disk is represented by five flattened persistent valvate fringed blades, applied to the inside of the petals. The nearly superior or partly inferior ovary has five cells superposed to the petals, or only from two to four; it is surmounted by an erect style, whose stigmatiferous head is divided into as many obtuse lobes as there are cells to the ovary. In the central angle of each of these is a placenta, forming a more or less irregular mass inserted by a short narrow stalk. Its whole surface is covered with little anatropous ovules. The fruit, surrounded by the desiccated perianth and disk, is a loculicidal capsule opening by as many valves, often bipartite, as there are cells. The seeds are small, with a rugose or foveolate outer coat, and a little axile embryo surrounded by a fleshy albumen. Some four or five species of *Argophyl-*

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1 HOOK., *Icon.*, t. 558.—A. CUNN., in *Tayl. Ann. Nat. Hist.*, ii. 356.—HOOK. F., *Fl. Nov.-Zel.*, i. 78.—BENTH., *Fl. Austral.*, ii. 437.—F. MUELL., *Fragm. Phyt. Austral.*, ii. 125; iii. 166; vi. 92, 189.—WALP., *Ann.*, vii. 906.

2 COMMERS., ex J., *Gen.*, 164.—DC., *Prodr.*, iv. 5.—ENDL., *Gen.*, n. 4676.—TUL., in *Ann. Sc. Nat.*, sér. 4, viii. 156.—B. H., *Gen.*, 648, n. 50.—*Defforgia* LAMK., *Ill.*, 71, t. 125.

3 The two cells of the ovary are usually complete at maturity.

4 The two horned styles bend back at dehiscence as far as the remains of the epigynous disk.

5 FORST., *Char. Gen.*, 29, t. 15.—L. FIL., *Suppl.*, 156.—J., *Gen.*, 161.—GÆRTN., *Fruct.*, iii. 149, t. 210.—DC., *Prodr.*, vii. 578.—ENDL., *Gen.*, n. 4679.—H. BN., in *Adansonia*, vi. 9.—B. H., *Gen.*, 646, n. 43.—SCHNIZL., *Iconogr.*, xv. t. 170.

6 Often forming an inverted pyramid, as in *A. nitidum* LABILL. In *A. ellipticum* LABILL. (?), on the contrary, it is a shallow cupule, so that the insertion is much more nearly hypogynous.

7 The anthers usually stick to the stigmatiferous end of the style.

lum are known,[1] shrubs from Australia, and especially New Caledonia, covered with silky down of sometimes submetallic lustre. The leaves are alternate, petiolate, simple, entire or dentate, exstipulate. The flowers form ramified corymbiform racemes, axillary or terminal.

Carpodetus serratus,[2] a shrub from New Zealand, is scarcely generically distinct from *Argophyllum*. Its narrow sepals do not touch; and its ovary, lodged inside the short everted funnel-shaped receptacle, is surmounted by a glandular disk with five scarcely prominent lobes, opposite to the petals, but not lining them with a fringed scale. The number of cells in the ovary varies from three to five, superposed to the petals in the latter case. In the ventral angle of each is a placentary mass, inserted by a short straight pedicel, and covered with ovules. The fruit is coriaceous, slightly fleshy, dehiscent, crowned by the circular cicatrix of the perianth. The cells contain an indefinite number of small descending seeds, with a foveolate outer coat, surrounding a fleshy albumen which lodges a small embryo near its apex. The leaves of this plant are alternate, petiolate, simple, with glandular teeth, and small stipules which are very inconspicuous at maturity. The flowers are in branching cymes, axillary, or terminal and leaf-opposed.

Berenice arguta,[3] a small undershrub from Bourbon, has nearly the flowers of *Carpodetus*, with a concave hemispherical receptacle lodging the ovary, five sepals, five valvate petals, and five epigynous stamens with introrse anthers. From the centre of the flat or depressed roof of the ovary rises an entire style, ending in a large stigmatiferous head. There are three or four cells, and in the centre of each is a multiovulate placenta forming a lobe with a cylindrical stalk. The fruit, crowned with the persistent sepals, is a depressed capsule, opening above by triangular loculicidal valves. The numerous rugose seeds contain a fleshy albumen, with an axile placenta. This plant has slender branches, with alternate simple serrulate leaves.

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[1] LABILL., *Sert. Austro-caled.*, 37, t. 40, 41.—F. MUELL., *Fragm.*, iv. 33; 177; vi. 188.—BENTH., *Fl. Austral.*, ii. 436.—WALP., *Ann.*, vii. 970.

[2] FORST., *Char. Gen.*, 33, t. 17.—J., *Gen.*, 382.—SPRENG., *Pugill.*, i. 20.—DC., *Prodr.*, ii. 29.—A. CUNN., in *Ann. Nat. Hist.*, iii. 247.—ENDL., *Gen.*, n. 5691.—HOOK., *Icon.*, t. 564.—FENZL, in *Regensb. Denk.*, 3, t. 12.—B. H., *Gen.*, 646, n. 44.—SCHNIZL., *Iconogr.*, xvii. t. 170.—WALP., *Ann.*, vii. 907.

[3] TUL., in *Ann. Sc. Nat.*, sér. 4, viii. 156.—B. H., *Gen.*, 646, n. 42.—WALP., *Ann.*, vii. 907.

The flowers form terminal ramified racemes; the pedicel of each flower bears lower down numerous alternate bracts.

In *Polyosma*,[1] the receptacle forms an elongated sac with a narrow mouth, around which are inserted a short four-toothed calyx, four long valvate petals, and four alternate epigynous stamens with two-celled anthers. The inferior one-celled ovary contains two multiovulate placentas, and is surmounted by a simple style with a stigmatiferous apex. The fleshy fruit contains only a single seed, whose thick fleshy albumen lodges a small embryo near its apex. Some half-score species of *Polyosma* are known,[2] trees from the warm regions of South and East Asia, and Oceania. Their leaves are opposite or alternate, exstipulate, petiolate, simple, entire or toothed, sometimes like those of a Holly. The flowers form large terminal racemes, or more rarely they are solitary. Underneath the receptacle are inserted two lateral bracts.

Itea[3] (figs. 409, 410) has regular hermaphrodite flowers. On th shallow cup-shaped receptacle, lined by a layer of glandular tissue, are inserted five sepals, imbricated, or narrow and early ceasing to

Itea virginica.

FIG. 409.
Flower ($\frac{2}{1}$).

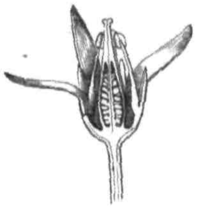

FIG. 410.
Long. sect. of flower.

touch, and five alternate petals, narrow and valvate. There are also five free stamens, superposed to the sepals, with introrse two-celled

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[1] BL., *Bijdr.*, 658; *Mus. Lugd.-Bat.*, i. 258, t. 57.—ENDL., *Gen.*, n. 4678 [1].—B. H., *Gen.*, 647, n. 48.

[2] BENN., *Pl. Jav. Rar.*, 196, t. 40.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 77.—BENTH., *Fl. Austral.*, ii. 438.—F. MUELL., *Fragm.*, vi. 189.—WALP., *Rep.*, ii. 379.

[3] L., *Gen.*, n. 275.—J., *Gen.*, 159.—GÆRTN., *Fruct.*, iii. 142, t. 209.—LAMK., *Dict.*, Suppl. iii. 190; *Ill.*, t. 147.—DC., *Prodr.*, iv. 6.—SPACH, *Suit. à Buffon*, v. 34.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, loc. cit.—ENDL., *Gen.*, n. 4677.—B. H., *Gen.*, 647, n. 47.—*Diconangia* MICHEL., *Gen.*, 5.—ADANS., *Fam. des Pl.*, ii. 165 (ex ENDL.).

anthers of longitudinal dehiscence. The gynæceum is free in great part or entirely; it consists of an elongated two-celled ovary, tapering above into a style which early divides into two branches, erect or reflexed, and stigmatiferous at the apex. In the ventral angle of each cell is a multiovulate placenta. The fruit is a septicidal bivalve many-seeded capsule. The seeds are elongated, numerous and with a laxly membranous testa, or few with a smooth crustaceous testa. The fleshy albumen surrounds a cylindroidal embryo. *Itea* comprises five species[1] of trees and shrubs from North America, and Temperate Eastern and Central Asia. Their leaves[2] are alternate petiolate exstipulate simple, oblong or lanceolate, with glandular teeth or crenulations. The flowers are numerous, in axillary or terminal simple racemes.

Phyllonoma ruscifolium.

FIG. 411.
Flowering branch.

Phyllonoma[3] has very small flowers, resembling those of *Berenice*, *Carpodetus*, *Itea*, &c., with a concave, obconical or obpyramidal receptacle bearing on its edges five little toothlike sepals, five triangular valvate petals, and five alternating stamens[4] with introrse didymous anthers. The inferior ovary is surmounted by a style with two short branches stigmatiferous at the apex;[5] it contains two pluriovulate parietal placentas alternating with the stylar lobes.[6] A thick fleshy disk covers the whole ovary. The fruit is fleshy, crowned by the scar of the perianth; it contains one or more seeds with a fleshy albumen, near the apex of which is a short embryo. Two or three species[7] are known, shrubs from Mexico and Columbia, in aspect like certain Celastrads, with elongated alternate petiol-

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[1] HOOK. & ARN., *Beech. Voy.*, *Bot.*, t. 39.—TORR. & GR., *Fl. N. Amer.*, i. 590.—A. GRAY, *Man.*, ed. 5, 146.—CHAPM., *Fl. S. Unit. States*, 155.—BENTH., *Fl. Hongkong.*, 128.—WALP., *Ann.*, vii. 908.

[2] Caducous in the two species with crustaceous seeds, the one American, the other Japanese.

[3] W., ex RŒM. & SCH., *Syst. Veg.*, vi. 210.—B. H., *Gen.*, 648, n. 49.—*Dulongia* H. B. K., *Nov. Gen. et Spec.*, vi. 76, t. 623.—ENDL., *Gen.*, n. 5699.—H. BN., in *Adansonia*, v. 293, 294; vi. 12.

[4] Inflexed in the bud.

[5] They are antero-posterior. The ovary recalls that of the Cornels and Umbellifers, or even certain Rhamnads, near which this genus has also been placed.

[6] We have usually seen six ovules on each placenta, arranged in two vertical rows.

[7] TURCZ., in *Bull. Mosc.* (1858), i. 454.—WALP., *Rep.*, i. 539 (*Dulongia*); vii. 908.

ate leaves. Their blade is surmounted by a long acumen, below the base of which the midrib bears on its upper surface the inflorescence, a little ramified raceme of cymes[1] (fig. 411).

Choristylis rhamnoides[2] has nearly the flowers of *Phyllonoma*, but its two parietal placentas come into contact when adult; and the two styles, each ending in a little stigmatiferous head, are at first approximated into a seemingly single column, afterwards separating and becoming recurved; and the fruit is a little septicidal capsule. This plant is a shrub from the Cape with the aspect of a Rhamnad, and bears alternate exstipulate leaves, and polygamous flowers in little supra-axillary ramified cymes.

With some doubt we place next to *Phyllonoma* and *Choristylis* the genus *Stichoneuron*,[3] hitherto made out a Santalad. Its flowers are polygamous. In those that have a gynæceum the ovary is sunk in a hollow obconical receptacle, and contains two pluriovulate parietal placentas;[4] it is surmounted by a style with two very short lobes. The rim of the receptacle bears a perianth of four decussate, or more rarely five imbricate leaves. To each is superposed a stamen whose erect filament bears above a little introrse subdidymous anther, of longitudinal dehiscence.[5] The ripe fruit and seeds are at present unknown. The plant is a shrub from the East Indies, with knotty, articulate (?) branches, bearing alternate oblong lanceolate shortly petiolate leaves, membranous and nearly glabrous, and axillary racemes of flowers, of which the filiform axis is covered above with numerous alternate bracts, each with an axillary floral pedicel, articulated in its upper half.

IX. BREXIA SERIES.

Brexia[6] (figs. 412–415) has regular hermaphrodite flowers, with a convex receptacle. This bears the following organs: a calyx

[1] The axes all diverge from their apparent insertion on the leaf. Really, the inflorescence, at first free, is after a certain age carried up with the midrib, as in *Helwingia*. Each floral pedicel is accompanied by a little bract.

[2] HARV., in *Hook. Journ.*, i. 19; *Fl. Cap.*, ii. 308.—ENDL., *Gen.*, n. 4676 [1].—B. H., *Gen.*, 647, n. 46.—*Bæobotrys rufescens* E. MEY.—*Mæsa palustris* HOCHST. (ex HARV., *loc. cit.*).

[3] *S. membranaceum* HOOK. F. & THOMS., in *Cat. Griffith* (1865), 42, n. 4387.—*Colpopodium* WALL. (ex GRIFF., herb.).

[4] The ovules are anatropous (HOOK. F.).

[5] After flowering the anthers fall, and the filaments persist.

[6] DUP.-TH., *Gen. Nov. Madagasc.*, 20.—LINDL., *Veg. Kingd.*, 573, fig. 388.—ENDL., *Gen.*, n. 4681.—AG., *Theor. Syst.*, 141, t. xi. fig.

very much like those of *Brexia*, are grouped in terminal racemes, each flower axillary to a leafy caducous bract.

Ixerba brexiodes[1] has regular flowers with a convex receptacle bearing five imbricated sepals, scarcely united below, and as many alternate petals, also imbricated in the bud. The five alternipetalous stamens have a free filament, and a versatile introrse two-celled anther of longitudinal dehiscence; they are inserted around a disk, with five alternating lobes. The gynæceum is free, with five prominent oppositipetalous cells, tapering above into a twisted style with five prominent ribs, and undilated at its stigmatiferous apex. In the ventral angle of each cell are two descending subcollateral anatropous ovules, with their micropyles upwards and outwards. The fruit is a coriaceous loculicidal capsule tipped by the persistent style, and opens on top by five recurved valves, bifid at the apex. There are one or two descending seeds in each cell, with a fleshy aril of the hilum[2] and a crustaceous outer coat; the large fleshy embryo has its radicle superior and is surrounded by fleshy albumen. *Ixerba* is a tree, with all its parts glabrous; the leaves are alternate opposite or verticillate, petiolate, narrow and elongated, exstipulate, with glandular teeth. The flowers are collected into short axillary cymes.

Roussea[3] (figs. 416–419) has nearly the flowers of *Brexia*, but with valvate sepals and petals. There are as many stamens as petals, alternating with them, possessing extrorse basifixed anthers and filaments of peculiar insertion. The superior ovary has five angles or prominent ribs on the lower part. Now the disk surrounding this is formed of five contiguous glands, bowed and crescent-shaped, with the concavity inwards. Each gland adheres by the centre of its concavity to one rib of the ovary, and meets its neighbour on either side (opposite a septum of the ovary, alternating with the ribs) to form a pretty deep pit, the whole inner wall of which is formed by the concave surface corresponding with each septum.

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1 A. CUNN., in *Ann. Nat. Hist.*, iii. 249.—ENDL., *Gen.*, n. 4681 [1].—H. BN., in *Adansonia*, v. 294; in *Payer Fam. Nat.*, 349.—B. H., *Gen.*, 645, n. 39.

2 As this is linear, extending along nearly the whole of the inner margin of the seed, the aril itself forms a longitudinal crest, thicker above, and adherent all along to the umbilical cicatrix.

3 SMITH, *Icon. ined.*, i. 6, t. 6.—GÆRTN., *Fruct.*, iii. 166, t. 212.—POIR., *Dict.*, vi. 318.—LAMK., *Ill.*, t. 75.—DC., *Prodr.*, vii. 522.—ENDL., *Gen.*, n. 4680.—H. BN., in *Payer Fam. Nat.*, 349; in *Adansonia*, v. 292.—B. H., *Gen.*, 645, n. 41.—*Roussoa* RŒM. & SCH., *Syst. Veg.*, iii. 3, n. 418.—*Rousseauvia* BOJ., *Hort. Maur.*, 246, n. 232.

And in this pit is inserted the stamen. The fruit is a berry, with the reflexed calyx surrounding its base (fig. 419); the numerous

Roussea simplex.

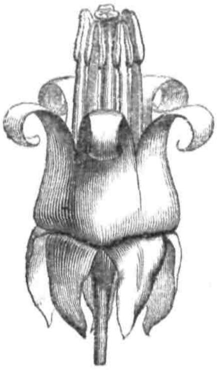

Fig. 416.
Flower ($\frac{2}{1}$).

Fig. 418.
Flower, perianth removed.

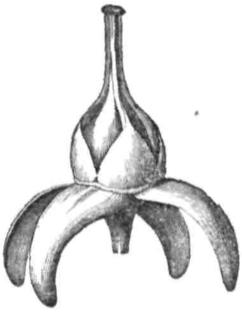

Fig. 419.
Young fruit.

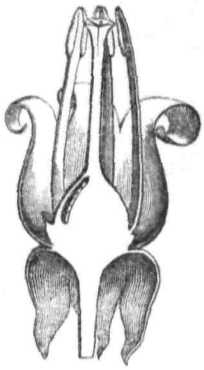

Fig. 417.
Long. sect. of flower.

seeds have their embryo surrounded by albumen. *R. simplex*,[1] the only known species, is a climbing shrub from the Mauritius, with opposite or verticillate leaves; the flowers are axillary, solitary, or in little cymes at first surrounded by the scales of the flower-bud.

We shall place next the two monotypic Australian genera *Abrophyllum* and *Cuttsia*.[2] The former has 5–6-merous flowers, possessing a superior ovary, surrounded at the base by a short calyx, valvate petals, and as many stamens inserted around an ill-developed hypogynous disk. The pluriovulate cells are surmounted by a short style, with scarcely prominent stigmatiferous lobes; the fruit is a many-seeded berry, with albuminous seeds. *A. ornans*[3] is a shrub with alternate, petiolate, lanceolate, serrate, exstipulate leaves; its flowers form terminal or axillary pedunculate dichotomous cymes. *Cuttsia vibernea*[4] has exactly the same habit; but its flowers, though in other respects very similar, have the receptacle cupuliform, and a

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[1] Smith, *loc. cit.*—Tratt., *Arch.*, ii. 64, t. 100.—Endl., *Icon.*, t. 107.—Tul., in *Ann. Sc. Nat.*, sér. 4, viii. 158.—Walp., *Rep.*, ii. 719; *Ann.*, v. 403.

[2] Hook. f., ex Benth., *Fl. Austral.*, ii. 437.—B. H., *Gen.*, 647, n. 45.—*Brachynema* F. Muell., *Fragm.*, iii. 90 (nec Benth.).

[3] Hook. f., *loc. cit.*—F. Muell., *Fragm*, vi. 189.—*Brachynema ornans* F. Muell. (ol.).

[4] F. Muell., *Fragm.*, v. 47, t. 40; vi. 189.—B. H., *Gen.*, 1004, n. 45 *a*.

little more concave, with from five to eight valvate petals, as many slightly perigynous stamens, and an ovary surmounted by a more elongated, cylindrical style, lobed only towards its stigmatiferous apex. And the fruit is not a berry, but a loculicidal capsule, with from four to six valves.

X. PITTOSPORUM SERIES.

Pittosporum[1] (figs. 420–425) has regular hermaphrodite flowers. On the convex receptacle are inserted five sepals, free or coherent at the base, quincuncially imbricated in the bud. The corolla

Pittosporum revolutum.

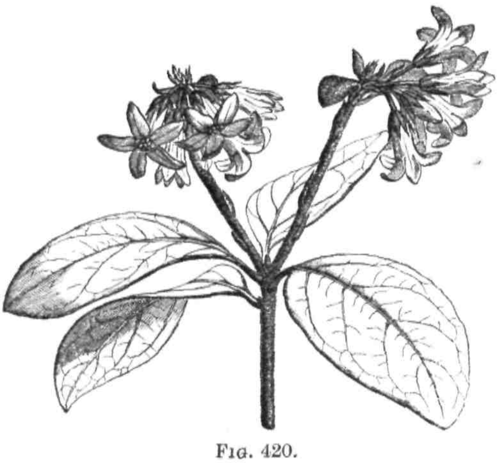

FIG. 420.
Flowering branch.

consists of five petals, free or sticking together by their edges, or even gamopetalous and connate into a tube for a variable distance, of contorted or imbricate præfloration. There are five alternating stamens; each filament is free, or sticks to the two petals with

[1] BANKS, ex GÆRTN., *Fruct.*, i. 286, t. 59.—LAMK., *Dict.*, iv. 426; Suppl., v. 361; *Ill.*, t. 143.—DC., *Prodr.*, i. 346.—SPACH, *Suit. à Buffon*, ii. 416.—ENDL., *Gen.*, n. 5661.—B. H., *Gen.*, 131, 973, n. 1.—H. BN., in *Adansonia*, v. 286; in *Payer Fam. Nat.*, 349.—SCHNIZL., *Iconogr.*, t. 236.—LEM. & DCNE., *Tr. Gén.*, 240.—*Senacia* COMMERS. (ex DC., *Prodr.*, i. 347).—? ? *Tribeles* PHIL., in *Linnæa*, xxxiii. 307 (ex B. H., *op. cit.*, 973).—? *Quinsonia* MONTROUZ., in *Mém. Acad. Lyon*, x. 178 (ex B. H., *loc. cit.*).

which it alternates and keeps them more or less in contact, and bears an introrse two-celled anther of longitudinal dehiscence.[1] The

Pittosporum revolutum.

FIG. 421.
Flower ($\frac{2}{1}$).

FIG. 422.
Diagram.

FIG. 423.
Long. sect. of flower ($\frac{8}{1}$).

free ovary is formed of two nearly complete or incomplete cells, the parietal placentas usually touching without cohering. More rarely we find from three (fig. 424) to five cells. The indefinite ovules, biseriate on each placenta, are anatropous, usually ascending. The ovary bears a style, more or less dilated at the apex into a head; this may be subentire or divided into as many indistinct lobes as there are placentas. The fruit is a capsule; it opens lengthwise into two or more rarely more concave valves, on the middle of each of which is a polyspermous placenta. The seeds are usually surrounded by viscid juice, and contain a hard or fleshy albumen, with a little embryo near its apex (fig. 425). *Pittosporum* comprises some fifty species[2] of small trees and shrubs, from the warm and temperate regions of Asia, Africa, and Oceania.

Pittosporum Tobira.

FIG. 424.
Fruit opened.

FIG. 425.
Seed, long. sect. ($\frac{4}{1}$).

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[1] In *P. undulatum* the pollen consists of ovoid grains with three folds. When moistened they become spherical, with three papillate bands. (H. MOHL., in *Ann. Sc. Nat.*, sér. 2, iii. 338.)

[2] HOOK., *Icon.*, t. 621.—HOOK. & ARN., in *Beech. Voy.*, *Bot.*, t. 32.—WIGHT & ARN., *Prodr.*, i. 153.—WIGHT, *Icon.*, t. 971; *Ill*, t. 70.—PUTTERL., *Syn. Pittosp.*, 5.—VENT., *Jard. Cels.*, t. 76.—BONPL., *Jard. Malm.*, t. 21.—ANDR., *Bot. Repos.*, t. 151, 383.—SWEET, *Fl. Austral.*, t. 25.—HOOK. F., *Fl. N.-Zel.*, t. 10; *Handb. N.-Zeal. Fl.*, 18, 725.—A. GRAY, *Amer. Expl. Exp.*, *Bot.*, t. 17–19.—AD. BR. & GR., in *Ann. Sc. Nat.*, sér. 5, ii. 141; in *Bull. Soc. Bot. de Fr.*, xi. 185.—*Bot. Reg.*, t. 16, 186.—*Bot. Mag.*, t. 1396, 1684, 2075, 3161.—WALP., *Rep.*, i. 250; v. 71; *Ann.*, i. 77; ii. 87; iv. 241; vii. 234.

Their leaves, often persistent, are simple, alternate, or subverticillate, exstipulate. The flowers are axillary, or more frequently terminal; solitary, or more frequently grouped in simple or branching racemes, sometimes corymbiform (fig. 420.)

Under the name of *Hymenosporum*[1] a distinct genus has been made for the Australian species, *P. flavum*,[2] with flattened seeds, edged by a wing; we shall hence make it a distinct section.[3]

All the seven genera grouped in this series around *Pittosporum* consist of Australian plants. In *Bursaria* and *Marianthus* the fruit is a loculicidal capsule. In *Marianthus*,[4] comprising spreading,

Marianthus tenuis.

FIG. 426.
Flower.

FIG. 427.
Long. sect. of flower ($\frac{2}{1}$).

flexuous, or twining undershrubs, the capsule is membranous or slightly coriaceous, thick or more or less compressed, and many-seeded. The genus comprises at present sixteen genera.[5] *Bursaria*,[6] which consists of two species of erect shrubs,[7] often spiny, has a coriaceous, compressed, flattened capsule, with only one or two vertical seeds in each cell; and the flowers are white, small and numerous.

In most of the other genera, the fruit is indehiscent, usually with the

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[1] F. MUELL., *Fragm.*, ii. 77.—B. H., *Gen.*, 131, n. 2.—BENTH., *Fl. Austral.*, i. 114.—WALP., *Ann.*, vii. 236.

[2] HOOK., in *Bot. Mag.*, t. 4799.

[3] The petals taper below; the style is hollow; the cells of the ovary are complete or incomplete.

[4] HUEG., *Enum. Pl. Nov.-Holl.*, 8.—ENDL., *Gen.*, n. 5664.—H. BN., in *Adansonia*, v. 287.—B. H., *Gen.*, 132, 973, n. 4.— *Oncosporum* PUTTERL., *Syn. Pittosp.*, 21. — *Calopetalon* HARV., in *Hook. Journ.*, vii. 52.—*Rhytidosporum* F. MUELL., in *Hook. f. Fl. Tasm.*, i. 39.

[5] BENTH., *Fl. Austral.*, i. 115.—LINK, KL. & OTT., *Ic. Pl.*, t. 12.—F. MUELL., *Pl. Vict.*, i. 75; *Fragm.*, ii. 145.—*Bot. Mag.*, t. 3893, 5233 (*Calopetalon*).—WALP., *Rep.*, i. 256; v. 72; *Ann.*, iv. 242 (*Calopetalon*); vii. 237.

[6] CAV., *Icon.*, iv. 30, t. 350.—ENDL., *Gen.*, n. 5662.—H. BN., in *Adansonia*, v. 287; in *Payer Fam. Nat.*, 350.—B. H., *Gen.*, 132, 973, n. 3.

[7] KLATT, in *Linnæa*, xxviii. 568.—BENTH., *Fl. Austral.*, i. 114.—*Bot. Mag.*, t. 1767.—WALP., *Rep.*, i. 255 (part.); *Ann.*, ii. 88; vii. 287. F. MUELLER unites the two described species into one.

whole thickness of the pericarp fleshy. This is the case with *Sollya*.[1] It has pentamerous flowers, with obovate petals separate from one

Pronaya elegans.

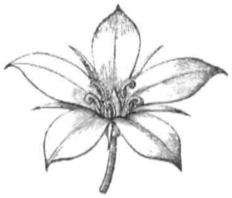

FIG. 428.
Flower.

FIG. 429.
Long. sect. of flower.

another from the base upwards, and spreading on anthesis. The five stamens have their filaments longer than the introrse two-celled anthers, which dehisce longitudinally. The two multiovulate placentas, at first parietal and free, come into contact, and often adhere along the middle line of the ovary. The genus comprises two or three undershrubs,[2] flexuous or twining, with pretty, drooping blue flowers. *Cheiranthera*[3] has nearly the same flowers; but the anthers all fall to one side of the androceum instead of surrounding it regularly; and their cells open by an apical pore.[4] The fruit is dry and loculicidal, with bifid valves. The species[5] of this genus approach *Sollya* in habit and inflorescence. *Billardiera*,[6] whose flower is also formed on the same plan as in *Sollya*, has its petals adherent or connivent halfway up into a tube (fig. 430); while the anthers, of longitudinal dehiscence, are shorter than the

Billardiera variifolia.

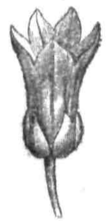

FIG. 430.
Flower.

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[1] LINDL., in *Bot. Reg.*, t. 1466.—ENDL., *Gen.*, n. 5666.—PAYER, *Organog.*, 174, t. 34.—H. BN., in *Payer Fam. Nat*, 350.—B. H., *Gen.*, 133, 973, n. 8.—? *Xerosollya* TURCZ., in *Bull. Mosc.* (1854), ii. 362.

[2] LABILL., *Pl. Nouv.-Holl.*, i. 65, t. 90 (*Billardiera*).—BENTH., *Fl. Austral.*, i. 126.—*Bot. Reg.* (1840), t. 3.—*Bot. Mag.*, t. 3523.—WALP., *Rep.*, i. 257; v. 73; *Ann.*, vii. 241.

[3] A. CUNN., in *Bot. Reg.*, sub n. 1719.—ENDL., *Gen.*, n. 5665.—H. BN., in *Payer Fam. Nat.*, 350.—B. H., *Gen.*, 133, n. 9.

[4] The two placentas touch down the centre of the ovary in *C. linearis*, but remain independent.

[5] HOOK, *Icon.*, t. 47.—AD. BR., in *Duperr. Voy.*, *Bot.*, t. 77.—BENTH., *Fl. Austral.*, i. 127.—F. MUELL., *Fragm.*, i. 97; ii. 79.—WALP., *Rep.*, v. 73; *Ann*, iv. 242; vii. 241.

[6] SM., *Bot. Nov.-Holl.*, t. 1.—ENDL., *Gen.*, n. 5668.—H. BN., in *Adansonia*, v. 287; in *Payer Fam. Nat.*, 350.—B. H., *Gen.*, 132. n. 6.—*Labillardiera* RŒM. & SCH., *Syst.*, v. 28.

filaments. The fruit is an ovoid or elongated berry. Half a score species have been described,[1] undershrubs with twining branches. *Pronaya*[2] (figs. 428, 429) has the same habit and vegetative organs, but its ovary is more decidedly one-celled at all ages, its fruit is fleshy, and its anthers shorter than the filaments, become revolute on anthesis. It is said to contain two or three undershrubs,[3] with white or blue flowers. *Citriobatus*,[4] on the contrary, comprises rigid spiny shrubs, like *Bursaria*. The solitary sessile flowers have petals connivent below, erect stamens, with the filaments longer than the anthers, a primarily one-celled ovary, and a globular coriaceous fruit. Two species have been described.[5]

XI. RIBES SERIES.

The genus *Ribes*[6] (figs. 431–442) was long made by all authors into a distinct order, often brought near *Cactaceæ*. It has regular flowers, hermaphrodite or polygamous. In the former, the concave receptacle lodges in its interior the inferior ovary, and then expands into a tube, funnel, or cupule, bearing the perianth and androceum on its rim. The calyx consists of five (more rarely four) sepals, of imbricate or subvalvate æstivation. They are often well-developed, nearly always much more conspicuous than the petals, and are erect

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[1] LABILL., *Pl. Nouv.-Holl.*, t. 89.—KLATT, in *Linnæa*, xxviii. 569.—HOOK. F., *Fl. Tasman.*, i. 36.—BENTH., *Fl. Austral.*, i. 122.—*Bot. Reg.*, t. 1719.—*Bot. Mag.*, t. 801, 1313, 1507.—WALP., *Rep.*, i. 257; *Ann.*, iv. 242; vii. 239.

[2] HUEG., *Bot. Arch.*, t. 6.—ENDL., *Gen.*, n. 5667.—B. H., *Gen.*, 133, n. 7.—*Campylanthera* HOOK., *Icon.*, t. 82.—*Spiranthera* HOOK., in *Bot. Mag.*, sub n. 3523 (nec A. S. H.).

[3] BENTH., *Fl. Austral.*, i. 125.—WALP., *Rep.*, i. 257; ii. 770; v. 73; *Ann.*, i. 77; vii. 240. More probably this genus contains but one species.

[4] A. CUNN., in *Loud. Hort. Brit.*, 585.—ENDL., *Gen.*, n. 5660.—H. BN., in *Adansonia*, v. 297; in *Payer Fam. Nat.*, 350.—B. H., *Gen.*, 132, 973, n. 5.—? *Ixiosporus* F. MUELL., *Fragm. Phyt. Austral.*, ii. 76.—WALP., *Ann.*, vii. 239.

[5] BENTH., *Fl. Austral.*, i. 121.—WALP., *Rep.*, i. 250; *Ann.*, vii. 238.

[6] *Ribes* L., *Gen.*, n. 281.—ADANS., *Fam. des Pl.*, ii. 243.—J., *Gen.*, 310.—LAMK., *Dict.*, iii. 47; Suppl., ii. 853; *Ill.*, t. 146.—DC., *Prodr.*, iii. 477.—SPACH, *Revis. Grossul.*, in *Ann. Sc. Nat.*, sér. 2, iv. 16; *Suit. à Buffon*, vi. 160.—ENDL., *Gen.*, n. 4682.—PAYER, *Organog.*, 388, t. 89; *Fam. Nat.*, 88.—B. H., *Gen.*, 654, n. 71.—SCHNIZL., *Iconogr.*, xiii. t. 171.—LEM. & DECNE., *Traité Gén.*, 273.—*Grossularia* T. *Inst.*, 639, t. 409.—GÆRTN., *Fruct.*, i. 149, t. 409 (incl.: *Botryocarpium* A. RICH., *Calobotrya* SPACH, *Cerophyllum* SPACH, *Chrysobotrya* SPACH, *Coreosma* SPACH, *Grossularia* A. RICH., *Rebis* SPACH, *Robsonia* BERL.).

spreading or recurved, petaloid or greenish. Alternate with these are inserted as many petals on the throat of the receptacle; they are

Ribes rubrum (Red currant.)

FIG. 431.
Flowering branch.

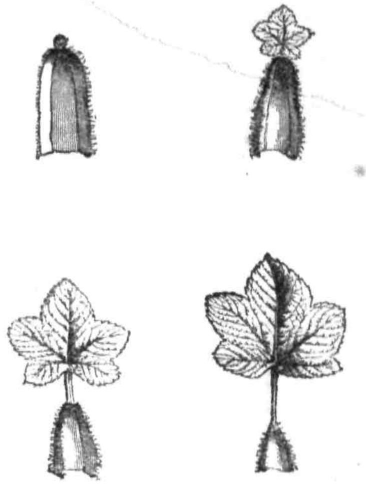

FIG. 432-35.
Leaves, various states.

often small and included, either not in contact or of imbricate præfloration. There are as many stamens, alternating and inserted with the petals; their filaments may be short and hidden between the petals, or long and exserted; the anthers are two-celled, subglobular or didymous, more rarely elongated-oval, introrse, of longitudinal dehiscence.[1] The ovary is surmounted by a style with two branches, that separate at a very variable height, and end in a stigmatiferous dilatation. They alternate with the two parietal placentas, which bear anatropous ovules, arranged in several rows when adult. Their number may be indefinite, or very inconsiderable; and this character, together with others derived from the form and length of the receptacle, calyx, and androceum, has been used to distinguish genera,

[1] The pollen consists in the species that have been examined, especially *R. Grossularia, rubrum, nigrum*, &c., of finely dotted spherical grains, having from eight to ten irregularly scattered pores. (H. MOHL., in *Ann. Sc. Nat.*, sér. 2, iii. 328.)

which we only retain as sections. The fruit (figs. 438, 442), crowned by the persistent calyx, and often by the remains of the corolla and

Ribes rubrum.

FIG. 436.
Diagram.

FIG. 437.
Long. sect. of flower ($\frac{4}{1}$).

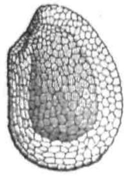

FIG. 439.
Seed ($\frac{6}{1}$).

FIG. 438.
Fruits.

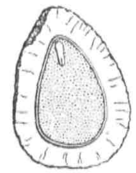

FIG. 440.
Long sect. of seed.

androceum, is a berry, containing a variable number of seeds in its pulp. These[1] have a pulpy or fleshy outer coat,[2] and a crustaceous deeper one, under which is the fleshy albumen, lodging a little cylindrical embryo near its apex. This genus consists of shrubs, unarmed or covered with glands[3] or prickles.[4] Their leaves are alternate, petiolate, simple, entire or variably incised, with the stipules absent, or membranous and adnate to the petiole. The flowers are solitary, fascicled, or more frequently in racemes, each flower axillary to a bract, and with usually a few sterile bractlets on

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[1] LEEUWENH., *Obs. on the Seeds of the Gooseberry*, in *Trans. Phil.*, xvii. (1693), 953, figs. 11, 12.

[2] It is chiefly formed of the hypertrophied cells of the outer ovular envelope, and hence represents a sort of generalized aril comparable to that of *Magnolia*, *Pierardia*, &c., but has different cell-contents. Thus the pulp of the fruit has a double origin, from the outer seed-coat as well as the pericarp.

[3] Often stipitate, secreting a viscid or resinous matter.

[4] They may be scattered over the branches, &c. In certain species they are, as we shall see below, localized at the insertion of the leaves, where they result from an extreme development of the suberous layer of the pulvinus. In this case they must not be confounded with spinescent stipules, for the stipules, when present, are to be found a little way off, with their usual characters.

the pedicel. The known species, some fifty in number, inhabit temperate Europe, Asia, and America, and have been grouped into a certain number of sections.

Ribes nigrum.

FIG. 441.
Inflorescence.

Our Red, White, and Black Currants belong to the section *Ribesia*;[1] the receptacle is everted, campanulate or tubular; their stamens have short filaments; and their unarmed branches bear leaves folded in vernation, and racemose flowers. *Symphocalyx*,[2] comprising several ornamental species, has the receptacle elongated and tubular, stamens with included filaments, unarmed branches, convolute leaves, and racemose flowers. *Robsonia*[3] has larger flowers, also with an elongated tube, long exserted stamens, few or solitary flowers, and the stems, branches, and fruits covered with prickles. Finally, our Gooseberries (*Groseille à Maquereau*) form the type of the section *Grossularia*,[4] also with solitary or few flowers, but with unarmed fruits, and possessing two kinds of prickles elsewhere; one kind is scattered over the branches, the other developed in definite numbers and some regularity at the pulvinus of the petiole. *Ribes* may in fine be defined as comprising *Saxifragaceæ* with a fleshy pulpy fruit. Half-a-hundred species are known,[5] natives of Europe, Asia, Temperate Africa and America, and Andine South America.

Ribes Grossularia.

FIG. 442.
Fruit.

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[1] BERL., *loc. cit.*, t. 2.—DC., *Prodr.*, sect. iii. —*Cerophyllum* SPACH, *Suit. à Buffon*, vi. 152.—*Coreosma* SPACH, *loc. cit.*, 154.—*Botrycarpum* A. RICH., *Elém.*, ii. 487 (ed. 4, ii. 359).—SPACH, *loc. cit.*, 158.—*Calobotrya* SPACH, in *Ann. Sc. Nat.*, sér. 2, iv. 21.—*Rebis* SPACH, *loc. cit.*, 26.

[2] BERL., *loc. cit.*, t. 2.—DC., *Prodr.*, sect. iv.—*Siphocalyx* B. H., *Gen.*, 655.—*Chrysobotrya* SPACH, *Suit. à Buffon*, vi. 148.

[3] BERL., in *Mém. Soc. Gen.*, iii. t. 1, fig. 1.—DC., *Prodr.*, sect. i.—SPACH, *Suit. à Buffon*, vi. 180.—ENDL., *Gen.*, n. 4683.

[4] A. RICH, *loc. cit.*—BERL., *loc. cit.*, t. 1, fig. 6.—DC., *Prodr.*, sect. ii.—SPACH, *Suit. à Buffon*, vi. 172.

[5] Twice as many have been described. R. & PAV., *Fl. Per.*, t. 232, 233.—HOOK., *Fl. Bor.-Amer.*, t. 76.—CAMBESS., in *Jacquem. Voy. Bot.*,

XII. BAUERA SERIES.

Bauera[1] (figs. 443–447) has a nearly flat or subconcave receptacle, on the margin of which are inserted the slightly perigynous perianth and androceum. The calyx consists of from four to ten persistent

Bauera rubiodes.

Fig. 443.
Flowering branch.

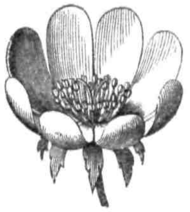

Fig. 444.
Flower ($\frac{3}{1}$).

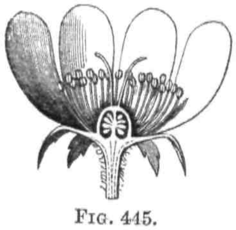

Fig. 445.
Long sect. of flower.

leaves, sometimes dentate, and of valvate or subimbricate æstivation. The corolla is regular, formed of as many alternate sessile imbricate petals. The number of stamens[2] varies from as many to five times

t. 76, 77.—Torr. & Gray, *Fl. N.-Amer.*, i. 544. —A. Gray, *Man.*, ed. 5, 164.—C. Gay, *Fl. Chil.*, iii. 32.—Wedd., *Chl. Andina*, ii. 214.—Hook. f. & Thoms., in *Journ. Linn. Soc.*, ii. 86.—Gren. & Godr., *Fl. de Fr.*, i. 634.—*Bot. Reg.*, t. 125, 1237, 1274, 1359, 1471, 1557, 1658, 1692.—*Bot. Mag.*, t. 3530, 4931.—Walp., *Rep.*, ii. 357; v. 822; *Ann.*, i. 975; ii. 687; v. 22; vii. 912.

[1] Banks, ex Kenned., in *Andr. Bot. Repos.*, t. 198.—Salisb., in *Kœn. Ann. of Bot.*, i. 12, t. 10.—DC., *Prodr.*, iv. 13.—Spach, *Suit. à Buffon*, v. 12.—Endl., *Gen.*, n. 4665.—H. Bn., in *Adansonia*, v. 301.—B. H., *Gen.*, 655, n. 72.

[2] In *B. rubioides* the clefts of dehiscence appear first above; later on they blend towards the top of the connective. The pollen is analogous to that of the *Saxifraga*, *Cunonia*, &c.

as many; they have free filaments inserted on a slightly thickened part of the receptacle, and introrse two-celled anthers of longitudinal dehiscence. The gynæceum consists of an ovary,

Bauera capitata.

FIG. 446.
Long. sect. of flower ($\frac{2}{1}$).

FIG. 447.
Long. sect. of flower.

with only its base inferior, of two cells,[1] surmounted by two styles, stigmatiferous at the undilated apex. On the interlocular septum are an indefinite number of anatropous ovules, arranged in several series.[2] The fruit is a bivalve loculicidal capsule, almost entirely free, compressed, often truncate at the apex. Under the seed-coats is a fleshy albumen enveloping a cylindrical axile embryo. Two or three species are known,[3] Australian branching shrubs, glabrous or covered with glandular hairs, with opposite sessile leaves, possessing two lateral leafy stipules, sometimes nearly as well developed as the leaf itself, so that one might fancy the leaves were in verticils of six. The flowers are solitary axillary, sessile or pedunculate.

XIII. CUNONIA SERIES.

For a long time the only known species of *Cunonia*[4] was *C. capensis* (figs. 448–451), which is often cultivated in the orangery. It has regu-

[1] At first the placentas do not touch.

[2] Thrice as many in fig. 444, five times in fig. 445.

[3] REICHB., *Ic. Exot.*, t. 77.—LODD., in *Bot. Cab.*, t. 1197.—DON, in *Edinb. N. Phil. Journ.*, ix. 95.—F. MUELL., in *Trans. Phil. Soc. Vict.*, i. 41; *Fragm.*, iv. 23; *Pl. Vict.*, ii. t. 16.—BENTH., *Fl. Austral.*, ii. 447.—*Bot. Mag.*, t. 715.—WALP., *Rep.*, v. 835; *Ann.*, vii. 914.

[4] L., *Gen.*, n. 556.—J., *Gen.*, 310.—GÆRTN., *Fruct.*, iii. 344, t. 225.—LAMK., *Dict.*, ii. 225; *Ill.*, t. 371.—DC., *Prodr.*, iv. 12.—SPACH, *Suit. à Buffon*, v. 10.—ENDL., *Gen.*, n. 4662.—PAYER, *Fam. Nat.*, 86.—B. H., *Gen.*, 654, n. 70.—*Osterdyckia* BURM., *Afr.*, 259, t. 96.—ADANS., *Fam. des Pl.*, ii. 445.

lar hermaphrodite flowers, with a convex receptacle bearing a short, very deeply five-lobed[1] calyx, at first imbricate in the bud. The free alternating petals, of imbricate æstivation, have a hypogynous insertion like the ten stamens; each of these consists of a free filament[2] and a didymous introrse two-celled anther of longitudinal dehiscence. The free superior gynæceum is formed of a two-celled ovary, surmounted by two long styles, tapering to their stigmatiferous apex. The base of the ovary is surrounded by an annular disk, with ten vertical grooves at the margin corresponding with the staminal filaments.[3] The cells of the ovary, complete or incomplete, are separated by the two placentas, which spring from their walls laterally, alternating with the styles, and meet inside, their thickened edges becoming united or remaining separate. In each cell are two vertical rows of descending anatropous ovules. The fruit (fig. 451) is a coriaceous septicidal bivalve capsule, surmounted by the persistent styles; each navicular valve is detached not merely at its edges but at its base, and rises up more or less, remaining adherent by its tapering apex to the columella of the fruit.[4] Thus are freed the numerous elongated compressed seeds, with their outer coats expanded into a wing at either end, and containing a fleshy albumen, which surrounds a small axile embryo, with elongated cotyledons and a superior cylindrical radicle. Besides the African species,[5] the genus *Cunonia* embraces four or five others, natives of New Caledonia.[6] They are trees or shrubs, with the axis tumid at the insertion of the opposite petiolate trifoliolate or pinnate leaves. These possess two large leafy interpetiolar stipules, at first applied to one another, afterwards coming off at the base. The white or pink flowers are arranged on a simple common axis axillary to the upper leaves, which forms a raceme bearing little groups of pedicellate flowers.[7]

Weinmannia[8] is scarcely generically distinct from *Cunonia*, of which

[1] Exceptionally hexamerous flowers occur.

[2] The filaments are longer in the alternipetalous stamens. In the bud each is folded above into a loop, with the anther inverted and its face turned in. Later on the filament becomes erect and exserted (figs. 449, 450).

[3] The pollen in *Cunonia* and *Weinmannia* is formed of ellipsoidal grains, with three folds, which, when moistened, become papillose bands.

[4] The whitish harder endocarp comes off more or less easily from the exocarp.

[5] *C. capensis* L., *Spec.*, 569.—LODD., *Bot. Cab.*, t. 826.—HARV. & SOND., *Fl. Cap.*, ii. 307.

[6] AD. BR. & GR., in *Ann. Sc. Nat.*, sér. 5, i. 370; in *Bull. Soc. Bot. de Fr.*, ix. 71.

[7] They appear to be in cymes on the common rachis.

[8] L., *Gen.*, n. 493.—J., *Gen.*, 309.—GÆRTN., *Fruct.*, 225.—LAMK., *Dict.*, vii. 578; *Ill.*, t. 313.—DC., *Prodr.*, iv. 8.—SPACH, *Suit. à Buffon*, v. 7.—ENDL., *Gen.*, n. 4655.—B. H., *Gen.*, 653, n. 69.—*Windmannia* P. BR., *Jam.*, 212.—

it has the flowers, hermaphrodite or polygamous, and tetramerous. But the calyx is here generally more imbricated and caducous. In the

Cunonia capensis.

FIG. 448.
Flowering branch ($\frac{1}{2}$).

septicidal capsule the valves part company from above downwards; and the upper part, gaping inwards, is not united with the columella. However, these characters are not constant in *Weinmannia*, and to distinguish it absolutely from *Cunonia* we must fall back on the seeds. These are globular or oblong, reniform, with a membranous

ADANS., *Fam. des Pl.*, ii. 343.—? *Pterophylla* DON, in *Edinb. N. Phil. Journ.*, ix. 93.—ENDL., *Gen.*, n. 4658.—*Arnoldia* BL., *Bijdr.*, 868.—DC., *Prodr.*, iv. 12.—ENDL., *Gen.*, n. 4659.

outer coat, often thinly sprinkled with hairs, rarely prolonged into a rudimentary wing. Some fifty species of this genus are known,[1] inhabiting all the warm regions of the Old World, very abundant in

Cunonia capensis.

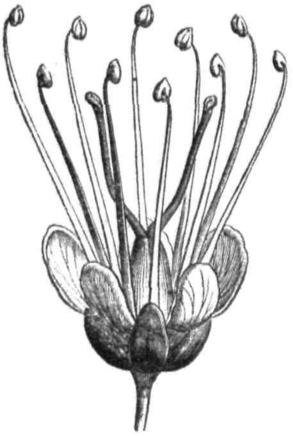

FIG. 449.
Flower ($\frac{3}{1}$).

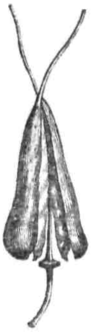

FIG. 451.
Fruit. dehiscing.

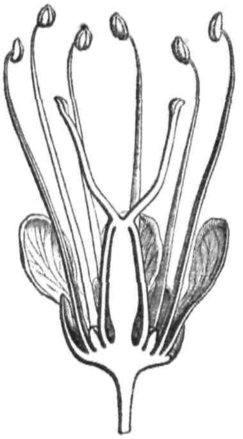

FIG. 450.
Long. sect. of flower.

South America, and extending into the south of North America. They are glabrous or tomentose, branching like *Cunonia*, with simple trifoliolate or imparipinnate leaves, possessing an often winged rachis, and coriaceous leaflets with frequently glandular teeth, caducous stipules, sometimes greatly developed, and axillary or terminal inflorescences of *Cunonia*.

Spiræanthemum[2] has apetalous polygamous flowers. The calyx consists of four or five valvate sepals, inserted on a small receptacle which bears more internally one or two whorls of stamens, as many glands as there are stamens, alternate with them and a little more

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[1] H. B. K., *Nov. Gen. et Spec.*, vi. 49, t. 520–524.—CAV., *Icon.*, t. 566.—R. & PAV., *Fl. Per.*, iv. (ined.), t. 330–334.—A. GRAY, *Unit. States Expl. Exp., Bot.*, t. 85.—CAMBESS., in *A. S. H. Fl. Bras. Mer.*, ii. 201.—RÉM., in *C. Gay Fl. Chil.*, iii. 45.—HOOK., *Ic.*, t. 301.—WEDD., *Chl. Andina*, ii. 209.—TUL., in *Ann. Sc. Nat.*, sér. 4, viii. 151.—GRISEB., *Fl. Brit. W. Ind.*, 303.—HOOK., F., *Fl. N.-Zel.*, i. 79.—AD. BR. & GR., in *Bull. Soc. Bot. de Fr.*, ix. 72; in *Ann. Sc. Nat.*, sér. 5, i. 372.—BENTH., *Fl. Austral.*, ii. 445.—WALP., *Rep.*, ii. 373; v. 129; *Ann.*, v. 29; vii. 910.

[2] A. GRAY, *Unit. States Expl. Exp., Bot.*, 666, t. 83.—B. H., *Gen.*, 650, n. 58.

internal, and from two to five carpels. In *S. vitiense*, the first species that was known, there are eight or ten stamens, half superposed to the sepals and half alternate with them. In several New Caledonian species the latter alone exist. All are free and possess a didymous introrse anther of longitudinal dehiscence. There are often as many carpels as sepals, and in this case alternating with them. They are sterile or quite rudimentary in the male flowers. In the females and hermaphrodites they are quite free, each formed of a one-celled ovary tapering above into a style, swollen and stigmatiferous at the apex. Inside the ovary is a placenta bearing either one descending anatropous ovule, with its micropyle upwards and outwards, or from two to five ovules, similar and biseriate. The fruit consists of from two to five follicles, dehiscing ventrally. The seeds are flattened or winged, with a fleshy albumen surrounding the embryo. Five Oceanian species have already been described,[1] trees or shrubs, with opposite or whorled caducous leaves possessing caducous stipules.

Tetracarpæa tasmanica,[2] a small shrub from Van Diemen's Land, comes near *Spiræanthemum* in the structure of its gynæceum. It has tetramerous flowers,[3] with a convex receptacle, four imbricate sepals, as many alternating free imbricate petals, and eight stamens superposed to the perianth-leaves, possessing free filaments, and basifixed anthers of submarginal dehiscence. The free superior gynæceum consists of four independent shortly stipitate carpels, superposed to the petals. Their one-celled ovary tapers above into a short style with a little stigmatiferous head. In the ventral angle of each ovary is a parietal placenta, bearing numerous anatropous pluriseriate ovules. The fruit is composed of four erect stipitate coriaceous follicles, opening down the ventral angle. The seeds are numerous, with a lax membranous outer coat, tapering at either end, and containing a fleshy albumen with a little embryo near its base. All the parts of *Tetracarpæa* are glabrous. Its leaves are alternate or subopposite, persistent simple, irregularly dentate, petiolate, exstipulate.

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[1] AD. BR. & GR., in *Ann. Sc. Nat.*, sér. 5, i. 373; in *Bull. Soc. Bot. de Fr.*, ix. 73.—VIEILL., *Pl. N.-Caléd.* (1865), 12 (ex *Bull. Soc. Linn. Norm.*, ix.).—WALP., *Ann.*, v. 23; vii. 909.

[2] HOOK. F., in *Hook. Icon.*, t. 264.—B. H., *Gen.*, 11, 648, n. 52.—BENTH., *Fl. Austral.*, ii. 445.

[3] Exceptionally pentamerous.

The flowers are grouped in little terminal racemes, each flower axillary to a bract, which may be adnate to its axillary pedicel.[1]

Geissois[2] may be considered as *Spiræanthemum* with united carpels. It has the same receptacle and calyx, tetramerous or pentamerous. But the free superior ovary is one-celled, with two multiovulate parietal placentas. The stamens, inserted below and outside the more or less marked glandular disk are sometimes twice as numerous as the sepals, four opposite them, and four alternate. In other cases the number is greater; either there are two large ones in front of each sepal, and two small ones alternating, or there are four large stamens alternating with the sepals, and two, three, or four in front of each. The fruit is a capsule, like that of *Weinmannia*, septicidal and polyspermous. The outer seed-coat is membranous and reticulate, enlarged into a wing above. There are five Oceanian species,[3] fine trees, with opposite compound leaves, and large stipules, comparable to those of *Cunonia*. Their flowers are in large simple or branching racemes.

Lamanonia[4] is analogous to *Weinmannia* and *Geissois*. Like the latter genus it has apetalous flowers, with five or six valvate sepals and a large number of stamens. Of these the five or six largest are superposed to the centre of the sepals, and the others are progressively smaller in the intervals of the sepals. The superior gynæceum, capsular fruit, and seeds are nearly those of *Weinmannia* or *Geissois*. Four species of this genus are known,[5] all arborescent, natives of South Brazil. They have opposite digitately compound leaves, with large membranous stipules. The flowers are in axillary racemes.[6]

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[1] "A very anomalous genus, approaching *Dilleniaceæ* closely in hypogynous stamens, follicles and anthers." (B. H., *Gen.*, 649.)

[2] LABILL., *Sert. Austro-Caled.*, 50, t. 50.—ENDL., *Gen.*, n. 4663.—B. H., *Gen.*, 650, n. 56.

[3] DON, in *Edinb. N. Phil. Journ.*, ix. 96.—A. GRAY, *Unit. States Expl. Exp.*, *Bot.*, 678, t. 86.—AD. BR. & GR., in *Ann. Sc. Nat.*, sér. 5, i. 368; in *Bull. Soc. Bot. de Fr.*, ix. 70.—BENTH., *Fl. Austral.*, ii. 445.—F. MUELL., *Fragm.*, v. 16, 180.—WALP., *Ann.*, v. 31; vii. 909.

[4] VELLOZ., *Fl. Flum.*, v. t. 104 (1827).—*Belangera* CAMBESS., *Syn. Cunon. Bras. Mer.* (1829), 3; in *A. S. H. Fl. Bras. Mer.*, ii. 203, t. 115–117.—DC., *Prodr.*, iv. 11.—SPACH, *Suit. à Buffon*, v. 9.—ENDL., *Gen.*, n. 4664.—B. H., *Gen.*, 650, n. 57.—*Polystemon* DON, in *Edin. N. Phil. Journ.*, ix. (1830), 95.

[5] MORIC., *Pl. Nouv.-Amér.*, t. 90.—WALP., *Ann.*, i. 338 (*Belangera*).

[6] We place here, with some doubt, *Gumillea auriculata* (R. & PAV., *Prodr.*, 42, t. 7; *Fl. Per. et Chil.*, iii. 23, t. 245;—ENDL., *Gen.*, n. 4660; —B. H., *Gen.*, 651, n. 60), which appears akin to the preceding genera, and has alternate imparipinnate leaves, with large stipules like those of *Weinmannia*. The flowers, though imperfectly known, also seem analogous to those of that genus; but they are apetalous, isostemonous, and sessile on the ramifications of the terminal pendulous inflorescence.

Ceratopetalum[1] has regular hermaphrodite flowers. Their receptacle forms a hollow inverted cone of variable depth framing the ovary, which is surmounted by a circular disk, with a more or less sharply crenulate edge. The calyx is inserted around the mouth of the receptacle, formed of four or five valvate triangular sepals. Between these are as many little rigid linear laciniate petals, which are absent in one species of the genus.[2] Inserted on the margin of the disk and between its crenulations are eight or ten stamens, half superposed to the sepals, and half (shorter) alternating with them; each consists of a free filament, inflexed in the bud, and afterwards erect, and an introrse two-celled anther of longitudinal dehiscence and tipped by a prolongation of the connective. The ovary, partly inferior, is two-celled and surmounted by two subulate recurved styles, stigmatose at the apex. In the ventral angle of each cell is a placenta usually bearing four descending biseriate ovules, subanatropous, with the micropyle upwards and outwards. The fruit is dry, surmounted by the persistent accrescent calyx. The endocarp is very hard, surrounded by a thin suberous mesocarp; the seed has a curved greenish embryo, surrounded by fleshy albumen. The two known species are Australian shrubs,[3] with opposite glabrous petiolate leaves, simple[4] or trifoliolate, accompanied by caducous interpetiolar stipules. The flowers are grouped in axillary and terminal pedunculate ramified cymes.

Aphanopetalum[5] derives its name from the fact that between the four large foliaceous imbricated accrescent sepals are four small petals, which may even be quite absent. They are inserted, like the eight stamens, around a deeply cupulate receptacle, on which is inserted a four-celled ovary, tapering into a style with four reflexed stigmatiferous branches. In each cell is a single descending reniform ovule with its micropyle downwards and inwards. The fruit is surrounded at the base by the leafy calyx, and has only one cell containing an arcuate seed, with a curved embryo surrounded by fleshy albumen.

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[1] SM., *Bot. N.-Holl.*, t. 3.—DC., *Prodr.*, iv. 13.—ENDL., *Gen.* n. 4651.—B. H., *Gen.*, 651, n. 61.

[2] *C. apetalum* D. DON, in *Edinb. N. Phil. Journ.*, ix. (1830), 94.—*C. montanum* D. DON, *loc. cit.*

[3] BENTH., *Fl. Austral.*, ii. 442.—F. MUELL., *Fragm.*, vi. 189.

[4] In *C. apetalum*. DON has made it the type of a section, *Meridema*.

[5] ENDL., in *Ann. Wien. Mus.*, ii. (ex *Gen.*, n. 4650); *Iconogr.*, t. 96.—B. H., *Gen.*, 650, n. 59.—*Platyptelea* DRUMM., in *Hook. Journ.*, vii. 55.

The two known species[1] are Australian glabrous shrubs, with opposite simple leaves, and small caducous stipules, or none at all.

Besides *Aphanopetalum*, three monotypic genera must be placed close to *Ceratopetalum*, only distinguishable therefrom by the varying depth of the receptacle, the form of the petals when present, and the consistency of the fruit. First comes *Anodopetalum glandulosum*,[2] a Tasmanian tree, with simple opposite leaves. This has 4–5-merous flowers, a valvate calyx, linear petals, a diplostemonous androceum inserted under a disk surrounding the dimerous gynæceum, and a fleshy one-seeded fruit. Next comes *Schizomeria ovata*,[3] a tree from New South Wales, which has also opposite simple leaves. It has pentamerous flowers, with ill developed dentate petals, and a free ovary like that of *Anodopetalum*, with two quadriovulate cells, and a drupaceous fruit with a one-seeded stone. *Platylophus trifoliatus*,[4] a South African tree, has nearly the same flower, tetra- or pentamerous, with a bifid capsular fruit, the valves separating from the placenta at maturity, and opposite trifoliolate leaves accompanied by little caducous stipules. Perhaps these three plants might strictly be made into only sections of a single genus.

Caldcluvia[5] has flowers strongly recalling those of both *Anodopetalum* and *Weinmannia*, with a shallow receptacle, four or five valvate sepals, as many small alternating petals, and a diplostemonous androceum. The stamens are free, with introrse two-celled anthers; they alternate with as many glands. The gynæceum is free, and like that of *Weinmannia*. The same applies to the fruits, whose numerous seeds have a lax membranous outer coat; and the embryo is surrounded by fleshy albumen. *C. paniculata*,[6] the only known species of the genus, is a Chilian shrub; its leaves are opposite simple petiolate, with

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[1] F. MUELL., *Fragm.*, i. 228.—BENTH., *Fl. Austral.*, ii. 441.—WALP., *Ann.*, v. 29 (*Platyptelea*).

[2] A. CUNN., mss. ex ENDL., *Gen.*, n. 4654.—B. H., *Gen.*, 652, n. 64.—BENTH., *Fl. Austral.*, ii. 440.—F. MUELL., *Fragm.*, vi. 189.—HOOK. F., *Fl. Tasm.*, i. 148.—*Weinmannia biglandulosa* A. CUNN., in *Hook. Icon.*, 301.

[3] D. DON, in *Edinb. N. Phil. Journ.*, ix. 94.—ENDL., *Gen.*, n. 4652.—BENTH., *Fl. Austral.*, ii. 442.—B. H., *Gen.*, 651, n. 62.—F. MUELL., *Fragm.* vi. 189.—*Ceratopetalum ovatum* CALEY, mss. (ex ENDL.).

[4] D. DON, in *Edinb. N. Phil. Journ.*, ix. 92.—ENDL., *Gen.*, n. 4653.—HARV. & SOND., *Fl. Cap.*, ii. 307.—B. H., *Gen.*, 652, n. 67.—*Weinmannia trifoliata* THUNB., *Prodr.*, 77; *Fl. Cap.*, 384.—DC., *Prodr.*, iv. 9.—*Trimerisma* PRESL, *Bot. Bem.*, 73.

[5] D. DON, in *Edinb. N. Phil. Journ.*, ix. 98.—ENDL., *Gen.*, n. 4661.—B. H., *Gen.*, 652, n. 66.—*Dieterica* SER., in *DC. Prodr.*, iv. 8.

[6] DON, *loc. cit.*—RÉM., in *C. Gay Fl. Chil.*, iii. 47.—*Weinmannia paniculata* CAV., *Icon.*, vi. 44, t. 565.—*Dieterica paniculata* SER., *loc. cit.*

glandular teeth, and large interpetiolar stipules, like those of *Cunonia* and certain *Weinmannias*.

The flowers of *Gillbeea adenopetala*[1] are hermaphrodite and irregular. The receptacle is very shallow, lined by a disk which forms a circular glandular area. Outside it are inserted five valvate sepals,[2] and five alternate shorter petals truncate or emarginate at the apex, which is bounded by two angles, each tipped by a little cupuliform gland. The androceum consists of ten subperigynous stamens superposed to the perianth-leaves. They have free filaments, and subglobular introrse two-celled anthers of longitudinal dehiscence. The gynæceum is free, inserted inside the area of the disk; it consists of a trigonous ovary surmounted by three recurved styles, stigmatiferous at the somewhat dilated apex. To each angle of the ovary corresponds a cell, in the ventral angle of which are inserted from two to six descending anatropous ovules, with the micropyle upwards and outwards. The fruit, at the base of which the receptacle forms a little cupule, is dry, with three wings resulting from the development of the angles of the ovary, and prolonged on to the outer edge of the styles. In the central part are three narrow elongated cells, of which one or two may be sterile. In the fertile ones is a single suspended seed, with a fleshy albumen surrounding a straight embryo, with the cotyledons longer than the radicle. The only species of this genus is a tree from tropical East Australia; all its parts bristle with hairs; the leaves are opposite pinnate, sometimes unifoliolate;[3] and its flowers form a large terminal raceme, with opposite branches covered with cymes, possessing opposite and alternate concave bracts and bractlets.

Acrophyllum venosum,[4] an Australian shrub with opposite or whorled leaves, has flowers of from four to six parts, with narrow persistent valvate sepals, imbricate petals, and a diplostemonous androceum. The filaments are long and exserted, the anthers didymous. The

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[1] F. MUELL., *Fragm.*, v. 17, 180; vi. 188.—B. H., *Gen.*, 1004, n. 65 *a*.

[2] Striate and tomentose.

[3] "With caducous stipules."

[4] BENTH., in *Maund. Botan.*, ii. t. 95; *Fl. Austral.*, ii. 443.—B. H., *Gen.*, 652, n. 63.—*A. verticillatum* HOOK., in *Bot. Mag.*, t. 4050.—*Calycomis verticillata* D. DON, in *Edinb. N. Phil. Journ.*, ix. 93 (nec R. BR.).—F. MUELL., *Fragm.*, vi. 189.—*Weinmannia venosa* KNOWL. & WESTC., *Fl. Cab.*, t. 65 (ex WALP., *Rep.*, ii. 373).—*W. australis* A. CUNN., in *Field N. S.-Wal.*, 353.—DC., *Prodr.*, iv. 9.

free superior gynæceum consists of an ovary, with two incomplete multiovulate cells, surmounted by two long diverging persistent styles. The fruit is a septicidal capsule, bearing on the edges of its two valves the numerous seeds. Thus this genus shows a close analogy in its flowers to *Geissois* and *Spiræanthemum*. The flowers are crowded in the axils of the leaves, or the bracts replacing them, into globular cymes, forming axillary false verticils.

Ackama[1] approaches both the preceding genera and *Weinmannia*. Its floral receptacle is subconcave; inside the valvate calyx are five bilobate alternipetalous glands. Outside the disk are five caducous narrow spathulate petals, and ten stamens, half superposed to these and half to the sepals. The filaments are free and subulate, incurved at the apex in the bud; the anthers are introrse two-celled, of longitudinal dehiscence, often tipped by a prolongation of the connective. The ovary is two- or three-celled, multiovulate; and the fruit is a septicidal capsule, with hairy seeds. *Ackama* includes two species,[2] trees from Australia and New Zealand, with opposite imparipinnate leaves and caducous stipules. The flowers are small in much branching, compound, axillary, or terminal racemes.[3]

Davidsonia pruriens[4] is a tree from North-east Australia, which owes its name to the irritating hairs with which it is covered. Its alternate imparipinnate leaves with two large stipules, are those of certain *Meliaceæ*, *Sapindaceæ*, or *Rosaceæ*, and its flowers are grouped in long ramified racemes of spikes; on the nearly flat receptacle are inserted four or five thick valvate sepals, and twice as many stamens; the short filament is inserted below a little hypogynous disk, and the anther is introrse two-celled, of longitudinal dehiscence. The gynæceum consists of a two-celled ovary surmounted by two slender styles, stigmatiferous at the apex. In either cell is a septal placenta bearing a variable number of ovules (usually six or eight) inserted in a circle around its edge, and more or less descending when adult.

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1 A. CUNN., in *Ann. Nat. Hist.*, ii. 358.—ENDL., *Gen.*, n. 4657.—B. H., *Gen.*, 653, n. 67.

2 HOOK. F., *Fl. N.-Zel.*, i. 79.—BENTH., *Fl. Austral.*, ii. 444.—A. GRAY, in *Unit. States Expl. Exp., Bot.*, 671, t. 84 (*Weinmannia*).

3 BENTHAM & HOOKER (*Gen.*, 653, n. 68) place here a genus that is quite unknown to us, *Spiræopsis celebica* (MIQ., *Fl. Ind.-Bat.*, i. p. i. 719;—WALP., *Ann.*, vii. 910), the *Dirhynchosia* of BLUME (*Mél. Bot.*, 1855, n. 1, ex WALP., *Ann.*, v. 31), a tree from Celebes, covered with stellate hairs and glandular dots, with opposite imparipinnate leaves like those of *Weinmannia*, diœcious 5–6-merous flowers, and a birostrate two-celled capsule.

4 F. MUELL., *Fragm.*, vi. 4, 249, t. 46.

The fruit is dry, indehiscent; it contains in either cell a single descending seed, whose fleshy embryo is said to be exalbuminous.[1]

XIV. CODIA SERIES.

Codia[2] (fig. 452) may be regarded as consisting of *Cunonieæ* with an inferior ovary and capitulate flowers. The receptacle forms a hollow cone,[3] on the rim of which are inserted four or five valvate sepals. Between these are as many narrow slender petals (which may be absent). The androceum consists of two whorls of stamens, inserted like the perianth, each formed of a slender free filament and an introrse didymous two-celled anther of longitudinal dehiscence. The ovary, quite inferior or nearly so, has two cells, complete or incomplete, each containing in its ventral angle two collateral descending anatropous ovules, with their micropyles turned upwards and outwards. It is surmounted by two diverging styles, stigmatiferous at the apex. The fruit is an achene; and the seed contains a small layer of fleshy albumen around the embryo. *Codia* embraces some five or six species of shrubs from New Caledonia.[4] The leaves are opposite simple and petiolate, with large usually caducous stipules. The capitula are axillary pedunculate globular, surrounded by an involucre of variable development, often formed of four bracts. Each flower[5] is itself axillary to a little bract.

Codia montana.

FIG. 452. Inflorescence.

Next to *Codia* come the two closely allied genera *Pancheria*,[6] and *Callicoma*, which have the same inflorescences of globular pedunculate

[1] In this character, and that of its stipules, this genus comes very near *Rosaceæ*, whereof, however, it has scarcely the perianth and sexual organs. F. MUELLER thinks it akin to *Gumillea* and *Spiræopsis*.

[2] FORST., *Char. Gen.*, 59, t. 30.—DC., *Prodr.*, iv. 7.—D. DON, in *Edinb. N. Phil. Journ.*, ix. 93.—ENDL., *Gen.*, n. 4647.—H. BN., in *Adansonia*, v. 296.—B. H., *Gen.*, 649, n. 53.

[3] Its outer layer bears a copious down, and easily comes off from the deeper layers at a certain age.

[4] LABILL., *Sert. Austro-Caled.*, 45, t. 46.—AD. BR. & GR., in *Bull. Soc. Bot. de Fr.*, ix. 76; in *Ann. Sc. Nat.*, sér. 5, i. 377.

[5] Whitish.

[6] AD. BR. & GR., in *Bull. Soc. Bot. de Fr.*, ix. 74; in *Ann. Sc. Nat.*, sér. 5, i. 374; in *Nouv. Arch. du Mus.*, iv. 27, t. 11 (nec MONTROUZ.).—B. H., *Gen.*, 649, n. 54.

capitula. In the former the flowers are polygamo-diœcious, with a variable number of parts to each verticil; and the receptacle is not

Callicoma serratifolia.

FIG. 453.
Flowering branch ($\frac{1}{3}$).

very marked, bearing above a cupulate disk, continuous, or with distinct glandular elements. Hence the gynæceum is superior. In the male flowers it remains rudimentary; in the females it consists of carpels free to a great extent. In each ovary are two collateral descending anatropous ovules, like those of *Codia;* but the placentary margins are so involute that the raphe becomes external with respect to the floral axis. The fruit is formed of two follicles, dehiscing

down the much-involute ventral angle, and containing one or two seeds whose micropyle is dilated into a wing. The embryo, surrounded by a layer of albumen, has its radicle superior. The five known species of this genus are New Caledonian shrubs with the habit of *Codia;* but their leaves are verticillate.

Callicoma serratifolia.

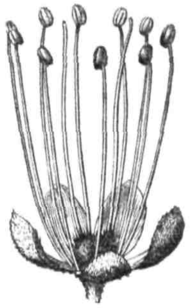

FIG. 454.
Flower ($\frac{4}{1}$).

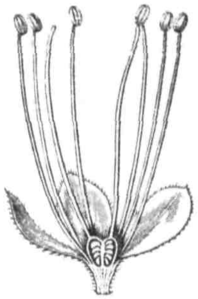

FIG. 455.
Long. sect. of flower.

Callicoma[1] (figs. 453–455) has opposite leaves, and hermaphrodite flowers, with a receptacle of variable depth. In *C. serratifolia*[2] which was long the sole constituent of the genus, the receptacle is scarcely concave; so that the ovary is nearly free (fig. 454), as in *Pancheria.* In *C. Stutzeri,*[3] on the contrary, half the ovary is sunk in the obconical cavity of the receptacle, nearly as in certain *Codias.* The flowers of *Callicoma* are apetalous; the cells of the ovary are complete or incomplete, multiovulate. The genus comprises Australian trees and shrubs.[4]

XV. BRUNIA SERIES.

Brunia[5] (figs. 456–458) has regular hermaphrodite flowers. In the hollow of the concave receptacle is lodged part of the ovary, and

[1] ANDR., *Bot. Repos.*, t. 566.—DC., *Prodr.*, iv. 7 (part.).—SPACH, *Suit. à Buffon*, v. 6.—ENDL., *Gen.*, n. 4648.—B. H., *Gen.*, 649, n. 55. —*Calycomis* R. BR., in *Flind. Voy.*, 549 (nec DON).—ENDL., *Gen.*, n. 4649.

[2] ANDR., *loc. cit.*—LODD., *Bot. Cab.*, t. 1167. —*Bot. Mag.*, t. 1811.—*C. ferruginea* DON, in *Edinb. N. Phil. Journ.*, ix. 93 (var. with brownish down).

[3] F. MUELL., *Fragm.*, v. 32; vi. 188, 252.

[4] BENTH., *Fl. Austral.*, ii. 440.

[5] BURM., *Afric.*, t. 100.—L., *Gen.*, n. 274 (part.). — ADANS., *Fam. des Pl.*, ii. 284. — J., *Gen.*, 381, 452.—GÆRTN., *Fruct.*, i. 152, t. 30.—LAMK., *Dict.*, i. 474.—AD. BR., in *Ann. Sc. Nat.*, sér. 1, viii. 372, t. 35, fig. 2.—ENDL., *Gen.*, n. 4597.—H. BN., in *Adansonia*, iii. 318; v. 295; in *Payer Fam. Nat.*, 346.—B. H., *Gen.*, 671, n.

its rim bears the perianth and androceum. The calyx is formed of five imbricate perigynous sepals, often tipped by a little blackish

Brunia phylicoides.

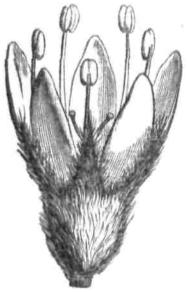

FIG. 457. Flower $(\frac{6}{1})$.

FIG. 456. Flowering branch.

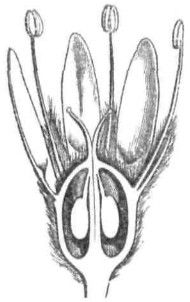

FIG. 458. Long. sect. of flower.

gland; the corolla of five alternating petals, oval or spathulate, imbricate or subvalvate. On the middle of their inner face they bear a prominent vertical crest, often divided above into two lips by a deep groove.[1] The androceum consists of five alternipetalous stamens, each formed of a free filament, and an introrse two-celled anther of very variable form.[2] The half-inferior gynæceum consists of a two-celled ovary surmounted by a style with two branches, free for a great distance, and indeed usually right down to the base, and dilated or undilated at the apex, which is covered with stigmatic papillæ. The cells of the ovary are separated by a septum, thick or thin, complete or incomplete; and against this in each cell is an axile placenta bearing above one, or more frequently two descending ovules, with their micropyles at first superior and introrse, and their raphes dorsal. Later on the former are turned aside and outwards, while the latter tend to touch by a torsion comparable to that which occurs in many *Hamamelideæ*.[3] The fruit is dry, either indehiscent or dehiscing by

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4.—LEM. & DCNE., *Tr. Gén.*, 247.—*Beckea* BURM., *Prodr.*, 12.—*Nebelia* NECK., *Elem.*, n. 197.

[1] Its apex is sometimes bifid.

[2] The pollen grains are ovoid, with three folds, which become papillose bands in water (*B. lanuginosa*, *B. abrotanifolia*). In *B. nodiflora* there are six folds and six bands (H. MOHL, in *Ann. Sc. Nat.*, sér. 2, iii. 338).

[3] The cells remain empty in certain species.

the splitting of the interlocular septum into two valves, each bearing a cleft of variable breadth on the ventral face. Through this escapes the seed,[1] containing a fleshy albumen with a little embryo near its apex. *Brunia* comprises half a score of species,[2] which, like all the plants of this group, are natives of South Africa, especially the Cape. They are little undershrubs, with the habit and persistent foliage of many Heaths. The leaves are alternate, linear or acicular, imbricated when young, with two very small glandular lateral stipules[3] at the base, often terminated, like the leaves, by a little glandular point. The flowers, grouped in globular terminal capitula, are each axillary to a bract and often accompanied by two lateral bractlets resembling the sepals. More rarely they form simple or ramified spikes.

The name *Raspalia*[4] has been given to species of *Brunia*, with usually uniovulate ovary-cells, a calyx wrongly held inferior,[5] and a perigynous corolla and androceum.

Berardia,[6] which we can only make a section of the genus *Brunia*, has the same flowers, with uniovulate cells and a dicoccous fruit. But the axillant bracts are longer than the flowers, instead of being equal or shorter, and form a sort of coloured involucre. This section contains three or four species.[7]

Staavia,[8] comprising half a dozen species, has the foliage of *Brunia*, and approaches it very nearly, especially the section *Berardia*, of which it has the coloured involucre. But the ovary is inferior, with two uniovulate cells, and surmounted by a style, scarcely notched at the stigmatiferous apex, and traversed on either side by a longitudinal groove continuous with the interlocular septum. The fruit is dicoccous; and below the apex of the seed is an annular frilled aril. Six species have been described,[9] all natives of South Africa.

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1 Unless the septum thickens and invades the cells with a spongy or suberous mass, the seeds then disappearing.

2 BREYN., *Cent.*, t. 10.—THUNB., *Fl. Cap.*, 202.—BERG., *Cap.*, 54.—WENDL., *Collect.*, t. 35.—HARV. & SOND., *Fl. Cap.*, ii. 313.—OLIV., in *Journ. Linn. Soc.*, ix. 333.

3 See *Adansonia*, v. 299.

4 AD. BR., in *Ann. Sc. Nat.*, sér. 1, viii. 377, t. 37, fig. 1.—ENDL., *Gen.*, n. 4598.—B. H., *Gen.*, 672, n. 5.—*Berardia* (part.).—HARV. & SOND., *Fl. Cap.*, ii. 320 (nec AD. BR.).

5 See *Adansonia*, iii. 320. In *R. microphylla* the calyx is superior, not inferior. The mistake has arisen from detaching the superficial layer of the inferior ovary right down to the base together with the sepals in softened herbarium flowers, while the corolla and androceum retained their normal epigyny.

6 AD. BR., in *Ann. Sc. Nat.*, sér. 1, viii. 380, t. 37, fig. 2.—ENDL., *Gen.*, n. 4600.—H. BN., in *Adansonia*, iii. 325.—B. H., *Gen.*, 672, n. 6.

7 HARV. & SOND., *Fl. Cap.*, ii. 318 (part.).

8 THUNB., *Prodr. Fl. Cap.*, 41.—ENDL., *Gen.*, n. 4599.—B. BN., in *Adansonia*, iii. 325.—B. H., *Gen.*, 672, 1006, n. 7.—*Levisanus* SCHREB., *Gen.*, n. 377.—*Astrocoma* NECK., *Elem.*, n. 196.

9 WENDL., *Collect.*, t. 22, 82.—HARV. & SOND., *Fl. Cap.*, ii. 321.

has a pentamerous calyx, corolla, and androceum inserted on the rim of a concave receptacle; this is often warty outside, and lodges in its concavity more or less of the two-celled ovary, which has from two to four descending ovules in each cell. But the septum being in great part absorbed, there is left an apparently free central placentary column, bearing near its apex[1] a crown of ovules.[2] A simple style surmounts the ovary. Four species of *Thamnea* proper have been described,[3] little shrubs or undershrubs from the Cape, with minute imbricate leaves and solitary flowers terminating the branches or short axillary twigs.

Brunia laxa,[4] which has been made the type of a genus *Tittmannia*,[5] is a somewhat exceptional *Thamnea*, its flowers being directly axillary to the leaves, and the septum[6] between its two biovulate cells being destroyed less rapidly and completely[7] than in *Thamnea* proper; accordingly, this genus may be regarded as forming the type of a distinct section of the genus.

XVI. HAMAMELIS SERIES.

The flowers of *Hamamelis*[8] (figs. 462–464) are hermaphrodite cr polygamous. In the former case the receptacle forms a deep cup, with four sepals of alternative-imbricate æstivation inserted on its rim. Between these are four long riband-shaped petals, involute in the bud. There are eight stamens in two whorls, four being superposed to the sepals and four to the petals. The former alone are

[1] This differs from truly free central placentas in that its enlarged apex adheres to the roof of the ovary.

[2] Descending, as in the other *Brunieæ*, and, as it appeared to us, with the micropyle finally upwards and outwards in the expanded flower.

[3] HARV. & SOND., *Fl. Cap.*, ii. 324.—OLIV., *loc. cit.*, 331, 332.

[4] THUNB., *Fl. Cap.*, 206.—*Mœsslera lateriflora* REICHB., *Consp.*, 160.—ECKL. & ZEYH., *Enum.*, 1086.

[5] AD. BR., *loc. cit.*, 29, t. 4, fig. 2.—ENDL., *Gen.*, n. 4603.—HARV. & SOND., *Fl. Cap.*, ii. 312.—B. H., *Gen.*, 671, n. 3.

[6] The presence of this septum leads OLIVER (*loc. cit.*, 333) to include our *Thamnea laxa* in the genus *Brunia*.

[7] However, we have found numerous flowers where the placenta was finally quite as free as in the other flowers. Hence this character is insufficient to separate the two types, and so is the difference of insertion of the flowers (axillary or terminal), which appears of no importance when we find flowers of *Thamnea* proper ending extremely short axillary twigs.

[8] L., *Gen.*, n. 169.—J., *Gen.*, 288.—LAMK., *Dict.*, iii. 68; *Ill.*, t. 88.—DC., *Prodr.*, iv. 268 (part.).—ENDL., *Gen.*, n. 4591.—AG., *Theor. Syst.*, t. 13.—H. BN., in *Adansonia*, iii. 323; v. 298; x. fasc. 4; in *Payer Fam. Nat.*, 345.—B. H., *Gen.*, 667, n. 7.—*Trilopus* MICH., in *Ann. Nat. Cur.*, viii. (ex ADANS., *Fam. des Pl.*, ii. 381).

fertile, and consist of a free filament, perigynous like the perianth-leaves, and an introrse basifixed two-celled anther. Each cell is elliptical with a well-marked outline, and opens along part of this outline by a curved cleft, which separates the wall of the cell like a valve from the connective.[1] The latter is prolonged into a fleshy obtuse tip. The other stamens, usually described as glands, are reduced to

Hamamelis virginica.

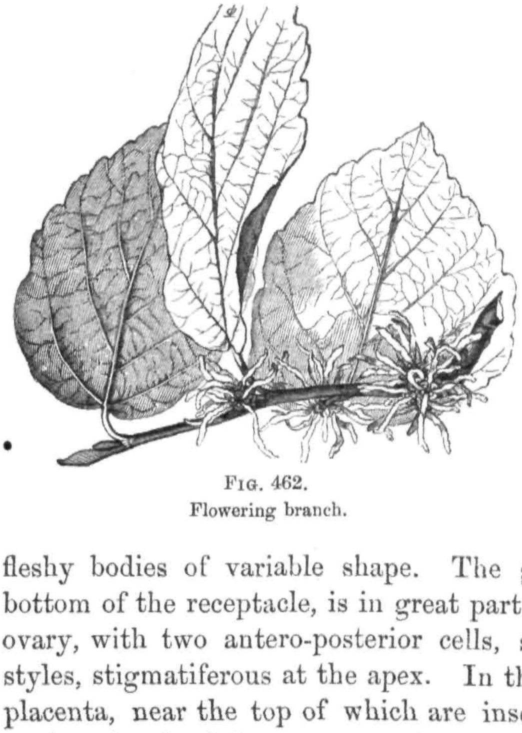

FIG. 462.
Flowering branch.

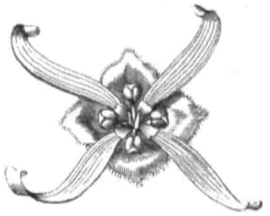

FIG. 463.
Flower ($\frac{2}{1}$).

FIG. 464.
Long. section of flower.

fleshy bodies of variable shape. The gynæceum, inserted in the bottom of the receptacle, is in great part superior. It consists of an ovary, with two antero-posterior cells, surmounted by two arcuate styles, stigmatiferous at the apex. In the ventral angle of each is a placenta, near the top of which are inserted one or two descending ovules; in the latter case one has its development early arrested. The other is anatropous,[2] with its micropyle upwards and inwards and its raphe dorsal; but, owing to a more or less complete torsion, the latter is turned to the right or left, and the former to the other side of a cell. In many flowers the gynæceum is small and sterile, or contains only the rudiments of ovules; the receptacle is then much shallower. The fruit is a dry capsule, partly sunk in the now

[1] In *H. virginica* the pollen grains are ovoid, with three grooves; moistened they are spherical, with three bands. (H. MOHL, in *Ann Sc. Nat.*, sér. 2, iii. 325.)
[2] It has two coats.

woody receptacle. It opens at the apex into two loculicidal valves, whereof the bivalve exocarp comes off from the parchmenty or horny endocarp, more or less convolute about the seed. This contains under its smooth crustaceous teguments[1] a fleshy albumen surrounding an axile embryo with oblong leafy cotyledons. *Hamamelis* comprises little trees, with alternate leaves closely recalling those of the Hazel, unsymmetrical at the base, dentate, with secondary ribs parallel to the margin of the blade, and two lateral stipules to the petiole. The shortly pedicellate flowers, each accompanied by a sort of involucre or calycle of three or four bracts, are arranged in small groups like glomeruli on the wood or in the axils of the leaves. Two species are known,[2] one from Japan, the other frequently cultivated here, from North America.

Under the name of *Loropetalum*,[3] a distinct genus has been made of a species of *Hamamelis* from China and Japan,[4] whose anthers open in a peculiar way; and we shall make it the type of a section of *Hamamelis*. Two lateral vertical clefts appear, one on either side of the anther. Then the lips of each cleft are continued on either side into a hook at both ends. Thus are formed two little flaps, which separate from the rest of the anther and open like folding doors; they are somewhat unequal, the outer being the larger. This section comprises one shrub with persistent leaves.

Next to *Hamamelis* come *Corylopsis* and *Dicoryphe*, differing therefrom mainly in the form of various parts of the flower. The flowers of *Corylopsis*[5] are polygamous, often hermaphrodite,[6] usually pentamerous. The receptacle is concave, lodging a great part of the ovary. On its rim are inserted five coloured sepals, five petals of about equal length, and five free alternipetalous stamens. The anthers open either by marginal clefts, or else, these clefts being prolonged

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[1] Marked by a long umbilical cicatrix, oblique, and approaching one extremity of the seed.

[2] SCHKUHR, *Handb.*, t. 27.—DUHAM., *Arbr.*, i. t. 114.—R. BR., in *Abel's China*, App., 374.—TORR. & GRAY, *Fl. N.-Amer.*, i. 597.—A. GRAY, *Man.*, ed. 5, 147.—CHAPM., *Fl. S. Unit. States*, 156.—OLIV., in *Trans. Linn. Soc.*, xxiii. 459.—WALP., *Ann.*, vii. 936.

[3] R. BR., in *Abel's China*, App., 375, icon.—OLIV., in *Trans. Linn. Soc.*, xxiii. 459.—B. H., *Gen.*, 668, n. 9.

[4] *H. chinensis* R. BR., *loc. cit.*—DC., *Prodr.*, iv. 269, n. 3.—PLUKN., *Amalth.*, 32, t. 368, fig. 2.

[5] SIEB. & ZUCC., *Fl. Jap.*, i. 45, t. 19, 20.—ENDL., *Gen.*, n. 4589.—H. BN., in *Payer Fam. Nat.*, 344.—B. H., *Gen.*, 667, n. 5.

[6] In the gynæceum we find every transition between ovaries that are quite sterile and empty and those containing well-formed ovules. The cells may be well-marked, with ovules on the ventral angle, which yet do not attain full development, though in some cases a nucleus and its coats may be distinguished.

and arched at both ends, by single flaps[1] or valves, not double as in *Loropetalum*. Between the stamens are five glandular bifid or bilobate bodies, forming a sort of disk; they are probably staminodes. The ovary and ovules behave as in *Hamamelis*. The fruit is a bicuspidate capsule, with two bifid valves, and seeds of *Hamamelis*. *Corylopsis* inhabits temperate Central and Eastern Asia; it comprises three or four frutescent species,[2] sometimes cultivated in this country. The leaves are caducous,[3] with large caducous stipules. The flowers come out before the leaves, at the beginning of the season; forming pendant racemes or catkins, axillary to bracts or scales which are only the stipules of aborted leaves.

Dicoryphe[4] has usually tetramerous flowers, probably all hermaphrodite. The concave receptacle lodges the inferior ovary, as in the last genus, but the form of the perianth is quite peculiar. The calyx is a cylindrical coriaceous tube, with four valvate teeth, and comes off at the base in a single piece. The petals are four thick fleshy tongues. There are eight stamens, but the alternipetalous set are sterile. The four others[5] have flattened elongated basifixed anthers, with two introrse cells; each of these opens by a half-valve,[6] corresponding with half its wall, or by the opening of the whole of the outer wall into a complete valve. There are two cells to the ovary; the ovules, originally two in each cell, behave exactly as in *Hamamelis*. The fruit is a capsule. This genus comprises five or six shrubs from Madagascar,[7] with alternate or opposite entire persistent coriaceous leaves, possessing unsymmetrical stipules, often large and caducous. The flowers form terminal racemes, sometimes short, with the pedicels so short as to simulate capitula.

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[1] Their dehiscence shows a transition from the longitudinal cleft to the valves that are so marked in other genera, which greatly lessens the value of the character.

[2] GRIFF., *Pl. Cantor.*, 22.—HOOK. F. & THOMS., in *Journ. Linn. Soc.*, ii. 85.—HANCE, in *Ann. Sc. Nat.*, sér. 4, xv. 224.—*Bot. Mag.*, t. 5458.—WALP., *Rep.*, ii. 434; *Ann.*, vii. 936.

[3] Sprinkled with stellate hairs, like the young branches.

[4] DUP.-TH., *Gen. Nov. Madag.*, 12; *Hist. des Vég. des Iles Afr. Austr.*, 31, t. 7.—DC., *Prodr.*, iv. 269.—H. BN., in *Payer Fam. Nat.*, 344.—ENDL., *Gen.*, n. 4588.—B. H., *Gen.*, 667, n. 6.—*Dicorypha* SPRENG., *Syst.*, i. 546. — *Diania* NORONH., mss. (ex TUL.).—*Glycoxylum* CHAPEL., mss. (ex TUL.).

[5] The filaments are united in *D. stipulacea*, but we do not know whether they only stick together or are really monadelphous. The sterile stamens may stick to the contracted base of the petals, without, however, any real fusion.

[6] In *D. stipulacea* the anther first opens by a lateral cleft on each side; then the two internal half-cells bend inwards towards one another, while the dorsal ones remain in situ.

[7] JAUME S.-HIL., *Exp. Fam. Nat.*, ii. 368.—RŒM. & SCH., *Syst.*, iii. 845.—TUL., in *Ann. Sc. Nat.*, sér. 4, viii. 142.—WALP., *Ann.*, vii. 936.

Trichocladus[1] (figs. 465–466) has flowers closely resembling those of both *Hamamelis* and *Dicoryphe*, some pentamerous and others

Trichocladus crinitus.

FIG. 465.
Flower ($\frac{4}{1}$).

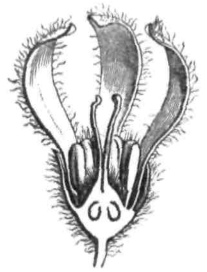

FIG. 466.
Long. sect. of flower.

tetramerous, polygamo-monœcious or diœcious, with a partly inferior ovary. The petals are very long and narrow, with revolute edges, except in the female flowers, where they are ill-developed or absent. The stamens have a short thick filament and a basifixed anther, opening laterally by two valves.[2] The ovary, surmounted by two subulate styles stigmatiferous at the apex, has two cells, wherein the ovule is twisted as in *Hamamelis*. Two species are known, which alone represent this series at the Cape. They are shrubs covered with stellate hairs, with opposite and alternate leaves, and terminal floral capitula, sometimes borne on short axillary branches. This last is the chief distinction between *Trichocladus* and *Hamamelis*, of which it has, on the whole, nearly the flowers and fruit.

In *Eustigma oblongifolium*[3] the flower is fundamentally the same, with a superior imbricate perianth, and anthers dehiscing nearly as in *Loropetalum*.[4] The inferior ovary and the ovule[5] found in either

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[1] PERS., *Syn.*, ii. 597.—DC., *Prodr.*, iv. 269.—ENDL., *Gen.*, n. 4590.—H. BN., in *Adansonia*, v. 298; in *Payer Fam. Nat.*, 344.—B. H., *Gen.*, 667, n. 8.—*Dahlia* THUNB., in *Skr. Nat. Selsk. Kiobenh.*, ii. 133, t. 4 (nec CAV.).

[2] HARV. & SOND., *Fl. Cap.*, ii. 324.

[3] GARDN. & CHAPM., in *Hook. Journ.*, i. 312.—SEEM., *Bot. Herald*, t. 95.—BENTH., *Fl. Hongkong.*, 132.—B. H., *Gen.*, 668, n. 11.

[4] Each cleft of the anther is at first lateral and vertical; it then is continued inwards and outwards to form a sort of double hook at top and bottom, thus marking out a pair of valves, which then open like folding doors.

[5] The raphe is at first dorsal, but owing to a partial torsion, the micropyle is brought to one side. The primine is slipper-shaped, enclosing the secundine closely applied to the nucleus, nearly as in the Box-tree.

cell are formed as in all the preceding genera; but the petals are very small, squamiform, subspathulate, geniculate, and swollen at the base; and the two styles are greatly developed, long and exserted, tapering to the articulated base, and expanded at the top into a large thick lobulate stigma, more or less folded on itself. The fruit is a capsule. This plant is a small glabrous tree from Hongkong, with persistent alternate leaves, possessing two little caducous stipules. The small flowers are grouped in little axillary racemes.[1]

Tetrathyrum subcordatum,[2] a shrub from the same country, has alternate ovate-oblong cordate leaves, coriaceous and persistent, and small numerous flowers in axillary capitula, with the same general organization, the hollow obconical receptacle lodging a two-celled ovary, in great part free, with uniovulate cells, surmounted by two subulate styles. And its fruit is a bivalve capsule. But the rim of the receptacle only gives insertion to five calycine leaves, valvate and subpetaloid, while the corolla is completely lost. In front of the sepals are five superposed stamens; their anthers dehisce longitudinally, the walls diverging from the cleft on either side, and they are surmounted by a long prolongation of the connective. Between each stamen and its neighbour projects a pair of rounded pubescent perigynous glands, free or united at the base.

The corolla is also quite absent in the four following genera, while the calyx, often reduced in size, presents great varieties in the number of its parts. This is especially marked in *Sycopsis Griffithiana*,[3] a tree (?) from Khasia, with nearly the foliage of *Eustigma*. Its flowers are monœcious; the gynæceum is in great part superior, with ovules of *Hamamelis*;[4] there are also eight stamens, but of a longitudinal dehiscence; while the perianth in both males and females is irregularly and obliquely incised into unequal teeth and lobes. *Parrotia*[5] was known for a longer time as an apetalous representative of *Hamamelis*. In fact its leaves, polygamous flowers, fruits (fig. 467), and seeds have the same general structure. But

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[1] The bractlets, inserted below the articulated ovary, form a little involucre, and each flower is at first hidden in its mother-bract.

[2] *Fl. Hongkong.*, 132.—B. H., *Gen.*, 668, n. 10.

[3] OLIV., in *Trans. Linn. Soc.*, xxiii. 83, t. 8.—B. H., *Gen.*, 666, n. 4.—WALP., *Ann.*, vii. 935.

[4] The position of the micropyle varies with age; at first it looks upwards and inwards, and may continue to do so permanently.

[5] C. A. MEY., *Verz. Pfl. Caucas.*, 46.—ENDL., *Gen.*, n. 4592.—H. BN., in *Adansonia*, v. 299; in *Payer Fam. Nat.*, 345.—B. H., *Gen.*, 666, n. 1.

there are from four to eight lobes to the calyx; and the androceum (whose anthers dehisce longitudinally) is rarely diplostemonous, more frequently isostemonous. The two species of *Parrotia* are trees from Persia and Cashmere.[1]

Parrotia persica.

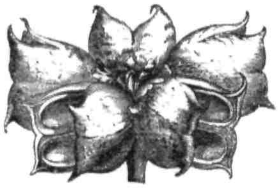

FIG. 467.
Fruit.

Distylium[2] presents the same variability in its polygamous flowers, from three to six unequal divisions in the calyx, and from two to eight or nine stamens,[3] analogous to those of *Sycopsis*. The gynæceum alone retains the fundamental organization of the preceding groups. But the receptacle is of no depth, so that the ovary[4] and capsular fruit remain free and superior. The two or three known species of *Distylium* are trees from South-east Asia,[5] with the simple leaves of *Eustigma* and *Sycopsis*, and axillary floral spikes.

Fothergilla alnifolia.

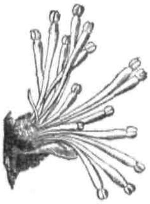

FIG. 468.
Flower.

FIG. 470.
Gynæceum ($\frac{3}{1}$).

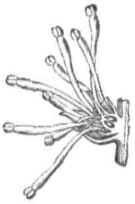

FIG. 469.
Long. sect. of gynæceum.

Finally, in *Fothergilla alnifolia*[6] (figs. 468–470), a North American shrub cultivated in our gardens, the polygamous flowers, though formed as in the preceding genera, have indefinite stamens, and only a rudimentary calyx. Hence we might describe the species as a

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1 DC., *Prodr.*, iv. 268, n. 2 (*Hamamelis*).—CAMBESS., in *Jacquem. Voy.*, *Bot.*, 73, t. 83.

2 SIEB. & ZUCC., *Fl. Jap.*, i. 178, t. 94.—H. BN., in *Payer Fam. Nat.*, 344.

3 The anther is basifixed, and the lines of dehiscence are nearly lateral, but a trifle introrse. In the bottom of each cell projects a rudiment of a secondary septum.

4 Each cell contains two ovules, of which one alone attains its full development.

5 BENTH., *Fl. Hongkong.*, 133.—WALP., *Rep.*, v. 928.

6 L. FIL., *Suppl.*, 42.—LAMK., *Dict.*, ii. 523; Suppl., ii. 665; *Ill.*, t. 480.—DUHAM., *Arbr.*, ed. nov., iv. t. 26.—TURP., in *Dict. d'Hist. Nat.*, *Atl.*, v. t. 199.—DC., *Prodr.*, iv. 269.—TORR. & GRAY, *Fl. N.-Amer.*, i. 597.—ENDL., *Gen.*, n. 4533.—H. BN., in *Payer Fam. Nat.*, 345; in *Adansonia*, x. fasc. 4.—A. GRAY, *Man.*, ed. 5, 148.—CHAPM., *Fl. S. Unit. States*, 157.—B. H., *Gen.*, 666, n. 2.—AG., *Theor. Syst. Pl.*, t. 13, fig. 5, 6.—*Bot. Mag.*, t. 1341, 1342.—WALP., *Ann.*, vii. 935.

polyandrous subachlamydeous *Hamamelis*. The receptacle is concave, subcampanulate, and its rim is thickened and irregularly crenulate, thus forming the sole representative of the calyx.[1] In the bottom is a half inferior ovary, with a solitary ovule in each cell, twisted as in *Hamamelis*, with its superior micropyle on one side.[2] The free perigynous stamens are unequal, and all belong to one verticil, despite their number. Each consists of a clavate filament, and a basifixed anther, opening at first by two lateral clefts. Later on their lips are reflexed into half-valves, as in *Loropetalum*, *Parrotia*, &c. The capsule and seeds are nearly those of *Hamamelis*. *Fothergilla* has alternate simple leaves, with two little lateral stipules. Its flowers develop before the leaves come out in terminal spikes, in early spring. In the spikes alternate approximated bracts succeed the young leaves; the lowermost are sterile; higher up they are axillant to usually male flowers, and still higher are generally the hermaphrodites.

Disanthus cercidifolius[3] is a Japanese tree, with alternate, petiolate, orbiculate-cordate leaves, and scarious caducous stipules. The flowers are in pairs at the apex of little axillary peduncles, and form, as it were, a little capitulum, with very short bracts at the base. The receptacle is concave, and the perianth closely analogous to that of *Hamamelis*. The sepals are scarious and much imbricate, like the petals, which form very long triangles, tapering at the apex. The five stamens have a short filament and an anther, with two ovoid extrorse cells, each opening by a dorsal cleft, the outer margin of which is then bent outwards. The dicarpellary gynæceum resembles that of the preceding genera; but in the ventral angle of each cell we usually find two series of descending ovules, usually three ovules in each row. The fruit is loculicidal and many-seeded.

Rhodoleia[4] has irregular subachlamydeous hermaphrodite flowers; they are formed of a nearly free gynæceum, surrounded by a certain number[5] of free stamens, around which we see only a little irregular

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[1] The superficial part of the receptacle has often been described as a calyx tube, adherent to the ovary.

[2] It was at first ventral. The ovule has two coats.

[3] MAXIM., *Mél. Biol.*, in *Bull. Acad. Petersb.*, vi. 20; in *Ann. Sc. Nat.*, ser. 5, vii. 379.—B. H., *Gen.*, 1005, n. 668.

[4] HOOK., in *Bot. Mag.*, t. 4509.—MIQ., in *Versl. e Meded. d. K. Ak. Wet. Nat.*, vi. 122.—H. BN., in *Adansonia*, iii. 176.—B. H., *Gen.*, 668, n. 12.—LEM. & DCNE., *Tr. Gén.*, 258.

[5] Six or more.

there are from four to eight lobes to the calyx; and the androceum (whose anthers dehisce longitudinally) is rarely diplostemonous, more frequently isostemonous. The two species of *Parrotia* are trees from Persia and Cashmere.[1]

Parrotia persica.

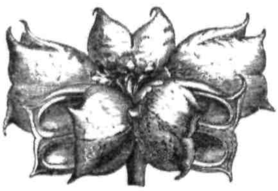

FIG. 467.
Fruit.

Distylium[2] presents the same variability in its polygamous flowers, from three to six unequal divisions in the calyx, and from two to eight or nine stamens,[3] analogous to those of *Sycopsis.* The gynæceum alone retains the fundamental organization of the preceding groups. But the receptacle is of no depth, so that the ovary[4] and capsular fruit remain free and superior. The two or three known species of *Distylium* are trees from South-east Asia,[5] with the simple leaves of *Eustigma* and *Sycopsis,* and axillary floral spikes.

Fothergilla alnifolia.

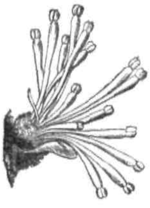

FIG. 468.
Flower.

FIG. 470.
Gynæceum ($\frac{3}{1}$).

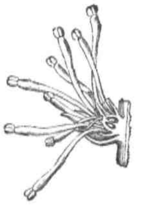

FIG. 469.
Long. sect. of gynæceum.

Finally, in *Fothergilla alnifolia*[6] (figs. 468–470), a North American shrub cultivated in our gardens, the polygamous flowers, though formed as in the preceding genera, have indefinite stamens, and only a rudimentary calyx. Hence we might describe the species as a

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[1] DC., *Prodr.*, iv. 268, n. 2 (*Hamamelis*).—CAMBESS., in *Jacquem. Voy.*, *Bot.*, 73, t. 83.

[2] SIEB. & ZUCC., *Fl. Jap.*, i. 178, t. 94.—H. BN., in *Payer Fam. Nat.*, 344.

[3] The anther is basifixed, and the lines of dehiscence are nearly lateral, but a trifle introrse. In the bottom of each cell projects a rudiment of a secondary septum.

[4] Each cell contains two ovules, of which one alone attains its full development.

[5] BENTH., *Fl. Hongkong.*, 133.—WALP., *Rep.*, v. 928.

[6] L. FIL., *Suppl.*, 42.—LAMK., *Dict.*, ii. 523; Suppl., ii. 665; *Ill.*, t. 480.—DUHAM., *Arbr.*, ed. nov., iv. t. 26.—TURP., in *Dict. d'Hist. Nat.*, *Atl.*, v. t. 199.—DC., *Prodr.*, iv. 269.—TORR. & GRAY, *Fl. N.-Amer.*, i. 597.—ENDL., *Gen.*, n. 4533.—H. BN., in *Payer Fam. Nat.*, 345; in *Adansonia*, x. fasc. 4.—A. GRAY, *Man.*, ed. 5, 148.—CHAPM., *Fl. S. Unit. States*, 157.—B. H., *Gen.*, 666, n. 2.—AG., *Theor. Syst. Pl.*, t. 13, fig. 5, 6.—*Bot. Mag.*, t. 1341, 1342.—WALP., *Ann.*, vii. 935.

polyandrous subachlamydeous *Hamamelis*. The receptacle is concave, subcampanulate, and its rim is thickened and irregularly crenulate, thus forming the sole representative of the calyx.[1] In the bottom is a half inferior ovary, with a solitary ovule in each cell, twisted as in *Hamamelis*, with its superior micropyle on one side.[2] The free perigynous stamens are unequal, and all belong to one verticil, despite their number. Each consists of a clavate filament, and a basifixed anther, opening at first by two lateral clefts. Later on their lips are reflexed into half-valves, as in *Loropetalum*, *Parrotia*, &c. The capsule and seeds are nearly those of *Hamamelis*. *Fothergilla* has alternate simple leaves, with two little lateral stipules. Its flowers develop before the leaves come out in terminal spikes, in early spring. In the spikes alternate approximated bracts succeed the young leaves; the lowermost are sterile; higher up they are axillant to usually male flowers, and still higher are generally the hermaphrodites.

Disanthus cercidifolius[3] is a Japanese tree, with alternate, petiolate, orbiculate-cordate leaves, and scarious caducous stipules. The flowers are in pairs at the apex of little axillary peduncles, and form, as it were, a little capitulum, with very short bracts at the base. The receptacle is concave, and the perianth closely analogous to that of *Hamamelis*. The sepals are scarious and much imbricate, like the petals, which form very long triangles, tapering at the apex. The five stamens have a short filament and an anther, with two ovoid extrorse cells, each opening by a dorsal cleft, the outer margin of which is then bent outwards. The dicarpellary gynæceum resembles that of the preceding genera; but in the ventral angle of each cell we usually find two series of descending ovules, usually three ovules in each row. The fruit is loculicidal and many-seeded.

Rhodoleia[4] has irregular subachlamydeous hermaphrodite flowers; they are formed of a nearly free gynæceum, surrounded by a certain number[5] of free stamens, around which we see only a little irregular

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[1] The superficial part of the receptacle has often been described as a calyx tube, adherent to the ovary.

[2] It was at first ventral. The ovule has two coats.

[3] MAXIM., *Mél. Biol.*, in *Bull. Acad. Petersb.*, vi. 20; in *Ann. Sc. Nat.*, ser. 5, vii. 379.—B. H., *Gen.*, 1005, n. 668.

[4] HOOK., in *Bot. Mag.*, t. 4509.—MIQ., in *Versl. e Meded. d. K. Ak. Wet. Nat.*, vi. 122.—H. BN., in *Adansonia*, iii. 176.—B. H., *Gen.*, 668, n. 12.—LEM. & DCNE., *Tr. Gén.*, 258.

[5] Six or more.

frill representing a disk, with a few unequally arranged little leaves, the sole vestige of the calyx. These flowers are grouped on a common receptacle into a capitulum, surrounded by a large number of imbricated dissimilar bracts arranged in a spiral. The outer ones are short,[1] broad, coriaceous-sessile, enlarging from without inwards. The innermost are petaloid, coloured, long-tapering at the base.[2] Each stamen consists of a free filament and a basifixed anther, with two elongated adnate cells; it dehisces by two longitudinal clefts, lateral or slightly introrse. The ovary is free in the greater part of its extent,[3] surmounted by two elongated caducous styles, stigmatiferous at the apex. In the ventral angle of each of the two (complete or incomplete[4]) cells of the ovary are found numerous anatropous ovules, in two vertical rows; they are descending, with their micropyles turned upwards and outwards. The fruit is dry and woody, bicuspidate, bivalve, and polyspermous. The seeds are compressed, angular, thin, and imbricated at the edges. Their internal structure is unknown. Two species of *Rhodoleia* have been described, one from China,[5] the other from Sumatra.[6] They are little glabrous trees, with persistent alternate leaves, simple, entire, coriaceous, glaucous below, petiolate and exstipulate. The floral capitula are borne each on a thick recurved peduncle.

XVII. LIQUIDAMBAR SERIES.

Liquidambar[7] (figs. 471–474) has its unisexual monœcious[8] flowers grouped in capitula and spikes. The axis of the male inflorescence

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1 Covered with down on their exposed surfaces.

2 From two to four of these bracts are inserted innermost, close outside the flower and near the disk, and seem to form a partial unilateral corolla to their flower.

3 The lower part, containing some ovules, is inferior as regards the disk, hence the insertion of the androceum is slightly perigynous.

4 Especially incomplete below, where often the placentas do not even touch. Higher up they are more or less fused in the Sumatran species, but in the Chinese they are only in contact, and may be separated without rupture; thus they are really parietal, as in so many of the *Saxifragaceæ*.

5 *R. Championi* HOOK., *loc. cit.*—LEM., *Jard. Fl.*, i. t. 4.—SEEM., *Bot. Herald*, 380.—V. HOUTTE, *Fl. des Serres*, vi. 87, t. 561.—BENTH., *Fl. Hongkong.*, 141.—WALP., *Ann.*, ii. 273; v. 89; vii. 936.—*R. formosa* CHAMP. (ex HOOK.).

6 *R. Teysmanni* MIQ., *loc. cit.*—WALP., *Ann.*, v. 87.

7 L., *Gen.*, n. 1076.—J., *Gen.*, 410.—GÆRTN., *Fruct.*, ii. t. 90.—LAMK., *Dict.*, iii. 532; Suppl., iii. 456; *Ill.*, t. 783.—ENDL., *Gen.*, n. 1902.—H. BN., in *Payer Fam. Nat.*, 348; in *Adansonia*, x. fasc. 4.—CLARKE, in *Ann. and Mag. Nat. Hist.* (1858), 1.—B. H., *Gen.*, 669, n. 15.—LEM. & DCNE., *Tr. Gén.*, 520 (incl. *Altingia* NORONH., *Sedgwickia* GRIFF.).

8 Sometimes polygamous in our cultivated plants.

is often elongated; it bears tufts of stamens, which have a usually short thick filament, and a basifixed anther with two lateral cells. There is no perianth, but only here and there a very little ring around the base of the stamens. In the female flowers this is usually more prominent, and less hesitation has been felt in describ-

Liquidambar styraciflua.

FIG. 471.
Flowering branch.

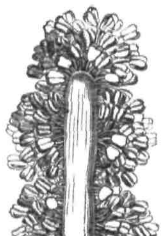

FIG. 472.
Long. sect. of male inflorescence.

FIG. 473.
Transv. sect. of female inflorescence.

FIG. 474.
Fruit.

ing it as the very short limb of a calyx. Inside are a variable number of stamens, with short filaments and antherless, or with sterile anthers, shorter than in the males. These may by accident become fertile, rendering the flower polygamous. Then the receptacle is hollowed so much that the cavity is in great part sunk into

the axis of the capitulum, lodging the greater part of the ovary. This has two multiovulate cells, complete or incomplete, and is surmounted by two styles, recurved and stigmatiferous at the apex. The ovules are descending and anatropous. The fruit consists of a large number of capsules, framed in the now woody common receptacle. Each one opens septicidally in its upper free part; the valves crowned by the indurated bases of the styles separate to free the numerous winged seeds. These are flattened, expanding into a membranous wing at the micropylar end, and contain in their coats an embryo with ellipsoidal cotyledons, three-ribbed at the base, and a superior cylindro-conoidal radicle. *Liquidambar* comprises three species,[1] all trees gorged with balsamic resinous juice; one inhabits North America, another Asia Minor, and the third Batavian India. Their leaves are caducous, alternate, petiolate, palmatilobate, with glandular teeth, and accompanied by glandular stipules. The female inflorescences are solitary, pedunculate at the ends of the branches or in the axils of the upper leaves; the males are usually spicate or racemose. At the base of each capitulum is an involucre of three or four unequal bracts.

Under the name of *Altingia*[2] have been described two other species from India and Malaysia, differing from the preceding in that their leaves are oval or oblong persistent, with persistent or caducous stipules, while the fruits are muticous, owing to the fall of the styles, and the inflorescences have but one or two bracts at the base. We shall make of these two Asiatic species[3] only a section of the genus *Liquidambar*.

Bucklandia[4] approaches *Liquidambar* very closely. Its flowers are polygamous, capitulate. The calycinal ring is more prominent, generally incised into five thick obtuse lobes. Inside we find, in the female and hermaphrodite flowers, four or more narrow linear tongues, described as either petals or sterile stamens. The gynæceum, which is free to a far greater extent than in *Liquidambar*, is

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[1] MICHX., *Arbr.*, iii. t. 4.—BL., *Fl. Jav.*, *Balsam.*, 6, t. 1, 2; in *Ann. Sc. Nat.*, sér. 2, ii. 91.—NEES, *Pl. Off.*, Suppl., ii. t. 12.—MIQ., *Fl. Ind.-Bat.*, i. add., 1097.—A. DC., *Prodr.*, xvi. 157 (part.).—ŒRST., *Amer. Centr.*, fasc. i. t. 10, 11.—SEEM., in *Bonplandia*, v. 104–122, 126, not.—WALP., *Ann.*, vii. 936.

[2] NORONH., in *Verh. Bat. Genootsch.*, v. 41.—H. BN., in *Payer Fam. Nat.*, 346.—A. DC., *Prodr.*, xvi. 157.—B. H., *Gen.*, 669, n. 14.—*Sedgwickia* GRIFF., in *Asiat. Res.*, xix. 98, t. 15, 16.—ENDL., *Gen.*, n. 4595.

[3] BL., *Fl. Jav.*, *Balsam.*, t. 1, 2 (*Liquidambar*).—SEEM.. *Bot. Herald*, t. 94; in *Bonplandia*, *loc. cit.* (*Liquidambar*, section I.).

[4] R. BR., in *Wall. Cat.*, n. 7414.—GRIFF., in *Asiat. Res.*, xix. t. 13, 14.—ENDL., *Gen.*, n. 4594.—H. BN., in *Payer Fam. Nat.*, 345.—B. H., *Gen.*, 668, n. 13.

surrounded by a thick disk; and its two-celled ovary is surmounted by a pair of styles, each traversed by a longitudinal groove, the lips of which widen and become reflexed, and covered with stigmatic papillæ near the apex. Each cell contains usually six ovules in two vertical rows, descending, with their micropyles upwards and outwards. The fruit is nearly free capsular, with two bifid valves; it contains winged descending seeds like those of *Liquidambar*. The superior are smaller and sterile. The stamens of the male flower have long slender filaments. The cells open down the edge, and separate right down that side from the connective, from which they then diverge like two concave valves. Two species of *Bucklandia* are known, trees from the mountains of India and Sumatra, with knotty articulated branches, alternate cordate coriaceous digitiveined petiolate leaves, and two large, oval or oblong coriaceous caducous stipules enveloping the young leaves and flowers, like those of *Cunonia*.

XVIII. PLANE SERIES.

We consider the Planes[1] (figs. 475–481) as representing the most reduced arborescent type of *Saxifragaceæ*, especially *Liquidambareæ*.

Platanus vulgaris (*Plane tree*).

FIG. 475.
Male inflorescences.

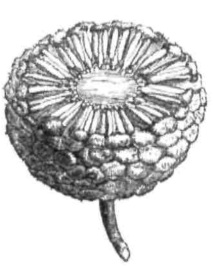

FIG. 476.
Male inflorescence, transverse section ($\frac{3}{1}$).

FIG. 477.
Female inflorescences.

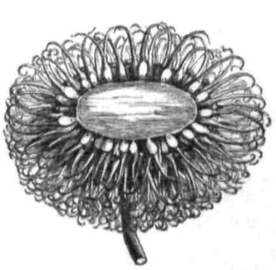

FIG. 478.
Female inflorescence, transverse section ($\frac{4}{1}$).

The flowers are, as in that series, monœcious and grouped in

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[1] T., *Inst.*, 590, t. 363.—L., *Gen.*, n. 896.—ADANS., *Fam. des Pl.*, ii. 377.—J., *Gen.*, 410.—GÆRTN., *Fruct.*, ii. 57, t. 90, fig. 5.—LAMK., *Dict.*, v. 437; Suppl., iv. 436; *Ill.*, t. 783.—

unisexual globular capitula.[1] In the males (figs. 475, 476) the receptacle bears a large number of small flowers, each formed of from three to six verticillate stamens, with very short, erect filament, and an erect elongated clavate basifixed anther, possessing two lateral cells of marginate dehiscence,[2] adnate to the connective, which is prolonged above them into a truncate head. Around these stamens

Platanus vulgaris.

FIG. 479.
Composite fruit.

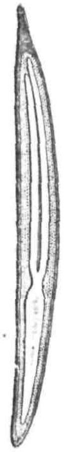

FIG. 481.
Long. sect. of fruit ($\frac{5}{1}$).

FIG. 480.
Single achene ($\frac{2}{1}$).

are two kinds of appendages: first from three to six scales, with a hairy tip, which are probably sepals; and inside these as many or fewer linear-clavate truncate bodies of greater length. The female flowers, also sessile in the receptacle, have a perianth like that of the males, but formed of three or four better developed leaves. Inside these are as many clavate appendages, which would seem to represent staminodes, if we might judge from their clavate form, the same as in the fertile stamens, only differing in the absence of anther-cells. Alternating with these sterile stamens (?) are seen a variable number of little glandular tongues, sometimes completely absent. Finally, the centre of the flower is occupied by a whorl of from two to

NEES, *Gen.*, ii. 17.—LINDL., *Veg. Syst.*, 187; *Veg. Kingd.*, 272.—ENDL., *Gen.*, n. 1901.—AGARDH., *Theor. Syst. Pl.*, 155, t. 13, figs. 1, 2.—SCHNIZL., *Iconogr.*, t. 97.—CLARKE, in *Ann. and Mag. of Nat. Hist.* (1852), 102, t. 6.—A. DC., *Prodr.*, xvi. sect. ii. 156.—LEM. & DCNE., *Tr. Gén.*, 518.—H. BN., in *Adansonia*, x. fasc. 4.

[1] Exceptionally they are said to be polygamous, the lower flowers becoming hermaphrodite.

[2] The pollen grains are ellipsoidal, with three longitudinal folds.

eight free carpels, superposed and slightly adherent to the base of the sepals, and each consisting of a free one-celled ovary; this tapers above into a recurved style, traversed by a ventral groove with stigmatiferous lips. In each overy is inserted near the apex of the ventral angle a descending ovule,[1] orthotropous or nearly so, with its micropyle downwards.[2] The fruit, borne on a spherical pedunculate receptacle, consists of a large number of elongated obpyramidal achenes, surrounding at the base by a fringe of long rigid hairs, and surmounted by the persistent style. Each achene contains a descending seed,[3] whose thin coats cover a fleshy albumen,[4] surrounding an axile embryo, with an inferior cylindro-conoidal radicle, and oblong cotyledons often unequal (fig. 481). The Planes are usually lofty trees, natives of North America and Mediterrannean Asia. The bark often peels off in plates of variable size and colour.[5] Their leaves are alternate, palmiveined and palmilobate,[6] covered with stellate down when young. The base of the petiole is swollen, and hollowed into a conical cavity which long envelopes[7] the axillary bud. It is accompanied by two lateral stipules, which unite below into a tube embracing the branch above the insertion of the leaves, and expands higher up into a more or less irregular cornet, with a dentate margin; above the stipules become quite detached to a variable extent.[8] The flowers are vernal; and the unisexual inflorescences are solitary, or grouped in a string, a few together and sessile, on a common pendant axis ending a young shoot. As many as half a score species have been made,[9] which may, no doubt, be reduced to two or three.[10]

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[1] There are said to be sometimes two.

[2] Often it rises up a little, instead of being quite inferior, the major axis of the ovule being slightly curved, as though through an attempt at anatropy. The ovule has two coats.

[3] Very frequently sterile in the trees cultivated in Europe.

[4] Some authors describe it as very thin; the majority say there is none.

[5] This exfoliation depends on the form of the plates of periderm that form large islands, distributed between the suberous layers, and which soon come away, carrying with them the adjacent suberous layers.

[6] "Margins of the blade longitudinally plicate externally in vernation." (DÖLL., 2 *Ekl. Laubkn. Ament.*, fig. 4.)

[7] Not totally, as would appear at first sight, for even when adult we may always find above and inside the cone formed by the dilated petiole a narrow opening into the cavity occupied by the bud, which proves that this is a groove in the upper surface of the petiole, whose lips have risen up and approached one another above the primitively free bud. The latter becomes visible and quite free at the fall of the leaf.

[8] They generally separate from one another, especially on the side next the petiole.

[9] DUHAM., *Arbr.*, ed. nov. ii. 7, t. 2.—NUTT., *Suppl. to the N.-Am. Sylv.*, i. 47, t. 15.—CATESB., *Carol.*, i. t. 56.—MORIC., in *Bull. Ferr. Bot.* (1830), 79; *Pl. Nouv. Amér.* (1833), 39, t. 26.—HOOK. & ARN., in *Beech. Voy., Bot.*, 160, 390.—MART. & GAL., in *Bull. Acad. Brux.*, x. n. 4, p. 2.—BENTH., *Voy. Sulph., Bot.*, 54; *Pl. Hartweg.*, n. 1961.—GREN. & GODR., *Fl. de Fr.*, iii. 145.

[10] Before the discovery of the recently described

XIX. MYOSURANDRA SERIES.

Myosurandra[1] (figs. 482–488) has regular diœcious, naked tetramerous flowers, grouped in spikes or catkins. The male flower consists of only four stamens, two antero-posterior, and two lateral,

Myosurandra moschata.

FIG. 483.
Male flower ($\frac{5}{1}$).

FIG. 482.
Male flowering branch.

FIG. 484.
Diagram of male flower.

inserted on a very small common receptacle; each consists of a long slender free filament, and a tetragonal, basifixed, introrse two-celled anther of longitudinal dehiscence, surmounted by a subulate prolongation of the connective. There is no trace of a gynæceum, nor is any rudiment of stamens to be found in the female flower. The latter (figs. 485–488) consists of a gynæceum, with a sessile elongated ovary, traversed by four longitudinal grooves, and divided into four

American species SPACH (in *Ann. Sc. Nat.*, sér. 2, v. 289) had reduced all the plants which had already been held distinct species (notably *P. orientalis* L. and *occidentalis* L.,) to one which he named *P. vulgaris*, comprising numerous forms and varieties.

[1] H. BN., in *Adansonia*, ix. 325, t. 8, 9.

cells which occupy the same position as the stamens in the male. Above the cells become free, each tapering into a style, which is grooved right down the ventral surface. The thickened reflexed borders of the groove are covered with numerous stigmatic papillæ.

Myosurandra moschata.

FIG. 487.
Diagram of female flower.

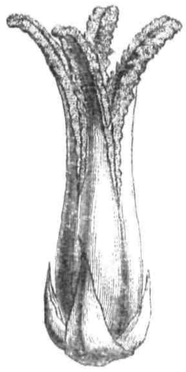

FIG. 486.
Female flower $(\frac{5}{1})$.

FIG. 485.
Female flowering branch.

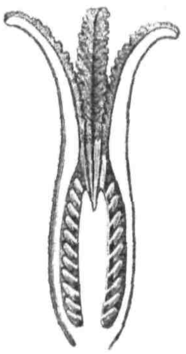

FIG. 488.
Long. sect. of female flower.

In the ventral angle of each cell is a placenta bearing numerous anatropous ascending ovules, with their micropyles looking downwards and outwards, and arranged in two parallel rows. The fruit consists of four follicles, slightly coherent by the inner edge; they dehisce ventrally. The seeds are indefinite, and contain in their coats a fleshy albumen, surrounding a little axile embryo. As yet only one species of this genus is known, *M. moschata*,[1] a shrub from Madagascar; all its parts have a musky scent, as the name applies. The branches are knotty. The leaves are opposite, each pair united below into a tubular sheath, which envelopes without adhering to

[1] We recently found this plant in BOJER's herbarium, under the name of *Anthospermum plicatum.*

the whole internode above the point of insertion. On the upper margin of this sheath are inserted four subulate stipuliform[1] tongues, two on either side. The leaf-blade is simple and elongated, folded longitudinally like a fan, with two ridges one side, and three alternating with these on the other, each ending near the top of the leaf in a crenulation or rounded tooth.[2] The floral spikes are solitary terminal, bearing opposite bracts; in the axil of each is a single sessile flower, accompanied by two lateral bractlets.

Myrothamnus flabellifolia,[3] a little shrub from the west and south of tropical Africa, has the habit, foliage, and inflorescence of *Myosurandra*, to which it is closely analogous. But its female flowers are trimerous, with one carpel anterior and two posterior; and its stamens, from three to eight in number, are monadelphous and united into a central column, instead of being free.[4]

XX? DATISCA SERIES.

Datisca[5] (figs. 489–496) has diœcious, or polygamous flowers. In the males (figs. 489, 490) there is a little convex receptacle, bearing a short gamosepalous calyx, with a very variable number of teeth,[6] and a much larger number of free stamens, each formed of a short or elongated slender filament, and an elongate basifixed two-celled anther of marginal dehiscence. The female flower (figs. 491–493) has, on the contrary, a long tubular or ovoid receptacle, bearing round its mouth a calyx with from three to six teeth. The cavity of the receptacle is occupied by the one-celled ovary, surmounted by three or more bifurcate styles, covered ventrally and towards the apex with stigmatic papillæ. Within the cell are the parietal placentas, covered with

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[1] One hesitates before describing these as true stipules, for they are inserted, not at the base of the leaf, but on a level with the base of the blade, hence they are, perhaps, the little lateral lobes of a trilobate leaf.

[2] The prominent folds on the two surfaces alternate; they correspond to longitudinal ribs, and alternate with furrows. The blade may be unfolded artificially.

[3] WELW., *Apont. Phytogeogr. Angol.*, 578, note 8; in *Trans. Linn. Soc.*, xxvii. 22, t. 8.—B. H., *Gen.*, 1005, n. 15 *a*.—H. BN., in *Adansonia*, ix. 328.—OLIV., *Fl. Trop. Afr.*, ii. 404.—*Cliffortia? flabellifolia* SOND., *Fl. Cap.*, ii. 597.

[4] [OLIVER (*loc. cit.*) describes the filaments as free.—TR.]

[5] L., *Gen.*, n. 1132.—ADANS., *Fam. des Pl.*, ii. 506.—J., *Gen.*, 445.—GÆRTN., *Fruct.*, i. 147, t. 30.—LAMK., *Dict.*, i. 601; Suppl., i. 79; *Ill.*, t. 825.—ENDL., *Gen.*, n. 5016.—PAYER, *Organog.*, 370, t. 61; *Fam. Nat.*, 119.—A. DC., *Prodr.*, xv. p. i. 410.—B. H., *Gen.*, 844, n. 1.—LEM. & DCNE., *Tr. Gén.*, 488.—*Cannabina* T., *Inst. Cor.*, 52, t. 488.—*Cannabis* P. ALP., *Exot.*, 298, 300 (nec Auctt.).—*Luteola* BAUH., *Pin.*, 100 (nec Auctt.).

[6] From four to ten.

numerous anatropous ovules; there are as many placentas as styles, with which they alternate, as they do with the outer divisions of the perianth when there are but three placentas. *Tricerastes*[1] often has

Datisca cannabina.

FIG. 490.
Male flower.

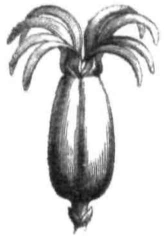

FIG. 493.
Tetramerous female flower.

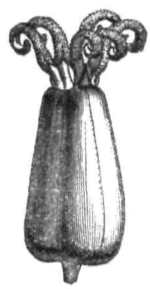

FIG. 491.
Trimerous female flower ($\frac{4}{1}$).

FIG. 489.
Male flowering branch.

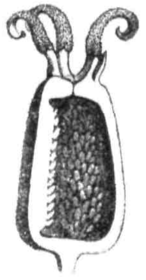

FIG. 492.
Long. sect. of female flower.

hermaphrodite flowers, with a variable number of stamens between the styles and the base of the superior perianth. The fruit which has lost the perianth is superior, and opens only at the apex, into three or more triangular valves, each continued above into one of the branches of the style (fig. 494). The seeds (figs. 495, 496) are very numerous, small and elongated. The outer coat is covered with a prominent network; and the fleshy subcylindrical embryo is surrounded by a thin layer of albumen, or none at all. Only two species of *Datisca* are known: one, with polygamous flowers inhabits Mexico and the neighbouring regions;[2] the other,[3] with diœcious

[1] PRESL, *Rel. Hænk.*, ii. 88, t. 61.—LINDL., *Veg. Kingd.*, 316, ic.—ENDL., *Gen.*, n. 5017.—A. DC., *loc. cit.*, 411.

[2] *D. glomerata.* — *Tricerastes glomerata* PRESL, *loc. cit.*—BENTH., *Pl. Hartweg.*, 334.

[3] *D. cannabina* L., *Spec.*, 1410.—SIBTH., *Fl. Græc.*, t. 960.—GRISEB., *Spicil.*, 502.—LEDEB., *Fl. Ross.*, i. 238.—*D. nepalensis* DON, *Prodr. Fl. Nepal.*, 202.

flowers, grows in nearly all the temperate parts of Western Asia. They are perennial herbs, in habit resembling Hemp. Every year they produce glabrous aerial branches, covered with alternate imparipinnate or trisect leaves, simple above. The flowers are grouped in cymes or glomeruli, either inserted in the axils of the leaves, or collected on a little common axillary peduncle.

Datisca cannabina.

FIG. 495.
Seed ($\frac{8}{1}$).

FIG. 494.
Fruit dehiscing ($\frac{4}{1}$).

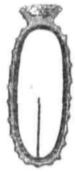

FIG. 496.
Long. sect. of seed.

To this group belong also *Tetrameles* and *Octomeles*, both with diœcious flowers. In *Tetrameles*[1] they are tetramerous. The males have four stamens with short anthers, superposed to the perianth-leaves. In the centre is a little four-lobed body, perhaps representing a rudimentary gynæceum;[2] these lobes alternate with the stamens. In the females the receptacle is elongated, as in *Datisca*, and contains an inferior ovary, with four multiovulate parietal placentas; these alternate with the perianth-leaves and the styles. The last are stigmatiferous at the apex; and the apex of the ovary is deeply depressed between their bases. Here we early see traces of four little grooves of dehiscence, alternate with the styles. The fruit is capsular, the seeds unkown. As many as three species of *Tetrameles* have been made, but there is probably only one.[3] It is a lofty tree with alternate, oval or cordate, petiolate, caducous leaves. The

[1] R. BR., in *Denh. et Clapp. Narr.*, App., 25.—ENDL., *Gen.*, n. 5015.—A. DC., *Prodr.*, xv. p. i. 411.—B. H., *Gen.*, 845, n. 2.—*Anicloclea* NIMMO, in *Grah. Cat. Bomb. Pl.*, 252.

[2] It has often been described as a disk.

[3] *T. nudiflora* R. BR., in *Benn. Pl. Jav. Rar.*, 79, t. 17.—THW., *Enum. Pl. Zeyl.*, 252.—*T. rufinervis* MIQ., *Fl. Ind.-Bat.*, i. 726; *Pl. Jungh.*

flowers, developed before the leaves, are very numerous, arranged in branching racemes, with slender divisions. *Tetrameles nudiflora* inhabits the hottest parts of India and Java.

Octomeles sumatrana,[1] a tree from the Indian Archipelago, with nearly the habit and foliage of *Tetrameles*; the flowers are octamerous. The males have a little hemispherical concave receptacle, bearing a calyx with eight erect teeth, eight small alternate petals, and eight alternipetalous stamens, each formed of a filament dilated at the base, and a long recurved anther. In the females the receptacle is a hollow cylinder containing an ovary, with eight thick parietal placentas, and is contracted above to expand again into a cup, which bears on its rim eight calycine teeth[2] and eight superposed divergent styles, surrounding a deep central depression as in *Tetrameles*. The fruit is dry. The flowers form long axillary spikes, with a thick rachis.

Saxifragaceæ was proposed as a distinct order[3] in 1789, by A. L. DE JUSSIEU;[4] it is a notable instance of what is called an order "*par enchaînement*." The hundred and ten genera that we give it[5] are grouped in twenty series, of which we shall now take a general view:—

I. SAXIFRAGEÆ.—These alone represented all the true types of the order to A. L. DE JUSSIEU. He admitted five genera, previously known to LINNÆUS and TOURNEFORT: *Heuchera*, *Saxifraga*, *Tiarella*,

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401.—*T. Grahamiana* WIGHT, *Icon.*, t. 1956.—*Anictoclea Grahamiana* NIMMO, *loc. cit.*

[1] MIQ., *Fl. Ind.-Bat.*, Suppl., 336.—A. DC., *Prodr.*, xv. p. i. 412.—B. H., *Gen.*, 845, n. 3.

[2] The petals, which, perhaps, fall early, have not been observed.

[3] B. DE JUSSIEU [*Ord. Nat.* (1759), in *A. L. de Jussieu Gen.*, lxix.] placed them formerly with *Semperviveæ*, and ADANSON [*Fam. des Pl.*, ii. (1763), 235], among his *Pourpiers* (Purslanes).

[4] *Gen.*, 308, Ord. II.

[5] Without mentioning those that are of doubtful kinship to the family or placed in it. Of these there are two (besides *Ostrearia*, which will be referred to below): 1. *Distomanthera* TURCZ. (in *Bull. Mosc.* (1862), ii. 328;—B. H., *Gen.*, 634;—WALP., *Ann.*, vii. 915), a Peruvian or Chilian plant, with simple opposite leaves and pentamerous flowers, possessing fifteen stamens, with porricidal anthers, and a partly inferior ovary with two or three pauciovulate cells.—2. *Cercidiphyllum* SIEB. & ZUCC. (in *Flora* (1847), 729;—MIQ., *Mus. Lugd.-Bat.*, ii. 140;—H. BN., in *Adansonia*, x. fasc. 4;—WALP., *Ann.*, i. 364). In this Japanese plant, with opposite leaves like those of the *Hamamelideæ*, we have observed flowers past bloom, or rather fruits, formed of four or less independent carpels, now become follicles, like those of certain *Cunonieæ*; they are surmounted by the persistent base of the style, and each contains two parallel series of oblique seeds, prolonged below into long descending wings, imbricated with those of the neighbouring seeds. The short woody branches of this plant are covered with opposite cicatrices, and end in a bud, below which is the pedunculate flower. The calyx is said to be inferior, formed of four coriaceous caducous sepals.

Mitella, and *Chrysosplenium*, to which he erroneously added *Adoxa*. De Candolle[1] added in 1830 *Leptarrhena, Tellima, Astilbe, Donatia Vahlia*, and *Lepuropetalum;* the number has since been increased to eighteen by the genera *Boykinia, Sullivantia, Bolandra, Oresitrophe, Leptarrhena, Eremosyne*, and *Tolmiea*. All these are usually herbs with a subterraneous stock, and frequently scapiform floriferous branches. The leaves are usually alternate exstipulate. The flowers are regular (exceptionally irregular, as in *Tolmiea*), usually pentamerous. The gynæceum has one or two (more rarely three) cells, complete or incomplete.

II. Penthoreæ.—This series consisting of the single genus *Penthorum*, previously referred to *Crassulaceæ*, comes very near many of those genera of *Saxifrageæ* whose carpels are free above. We thought it impossible to place *Penthorum*[2] in any other order than that of *Cephalotus*. It differs no doubt but slightly from the Crassulads, yet it lacks their fleshy succulent leaves; and its embryo, moreover, is surrounded by an albumen of noteworthy thickness. It is distinguished as a series by the receptacle, in which is plunged the lower half of the verticillate carpels, by the peculiar insertion of the perianth and androceum, and, finally, by the rudimentary condition of the corolla, when present.

III. Cephaloteæ.—The genus *Cephalotus*, founded in 1806, is the sole representative of this series, and was formerly held the type of a distinct order,[3] allied to *Renonculaceæ, Rosaceæ, Francoaceæ*,[4] &c. Later on Bentham & Hooker described it as an abnormal Saxifragad. We must note as the distinctive characters of this little series the form of its ascidia and receptacle, the free carpels, the ascending ovule with its micropyle downwards and inwards, the perigyny of the diplostemonous androceum, and the simple perianth, which perhaps represents a corolla.

IV. Parnassiæ.—The only genus of this series has been referred to most diverse orders.[5] It is characterized chiefly by its shallow

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[1] *Prodr.*, iv. 1–54. Here the *Saxifrageæ* form one of the five tribes of *Saxifragaceæ*.

[2] In *Andansonia*, vi., 3–6.

[3] *Cephaloteæ* R. Br., in *Phil. Mag.* (1832).—Lindl., *Veg. Kingd.*, 428.—*Cephalotaceæ* Lindl., *A Key to Bot.* (1835), n. 5.

[4] J. G. Agardh thinks these plants may be considered as *Triurideæ* with hermaphrodite flowers and carpels.

[5] "There is an old quarrel among systematists as to the affinities of *Parnassia*. Linnæus (*Fragm. Meth. Nat.*, in *Class Pl.*, 498) spoke

cupulate receptacle, the glanduliferous scales alternating with the stamens, the stigmatic lobes superposed to the multiovulate placentas, and the organization of the seeds.

V. FRANCOEÆ.—A series formed of two genera, one with regular (*Francoa*), the other with irregular flowers (*Tetilla*), both comprising scapigerous herbs, with iso- or diplostemonous tetramerous flowers. Carpels as many as petals, cohering into an almost completely superior ovary, with four complete or incomplete cells. Made by several authors[1] a distinct order, linking *Crassulaceæ, Saxifragaceæ*, and *Cephaloteæ*; according to others[2] allied to *Ericaceæ* and *Piroleæ*.

VI. HYDRANGEÆ. — Frutescent and arborescent plants. Leaves generally opposite,[3] simple, exstipulate. Petals often valvate. Stamens usually epigynous, diplostemonous or indefinite. Receptacle always concave. Ovary completely or partially inferior, with 3–5 cells, complete or more frequently incomplete. *Hydrangea*, alone known to A. L. DE JUSSIEU, was by him placed in the *Genera* Saxifragaceis *affinia*. DE CANDOLLE[4] made *Hydrangeæ* a tribe of *Saxifragaceæ*. LINDLEY[5] raised this to a distinct order, adding *Bauera*. The other genera, all closely analogous to *Hydrangea*, are of comparatively recent creation, viz., *Broussaisia*,[6] *Cardiandra* and *Platycrater*,[7] and *Pileostegia*.[8] *Dichroa* of LOUREIRO[9] (synonymous with *Adamia*) dates from the end of last century.

VII. PHILADELPHEÆ.—*Philadelphus*, placed by A. L. DE JUSSIEU in *Myrtaceæ*,[10] while *Deutzia* was relegated to the *Genera incertæ sedis*,[11] was made by DON[12] in 1826 the type of a distinct order,

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doubtfully of an alliance with *Ranunculaceæ*. ADANSON classed it with other most heterogeneous genera referred to the family *Cisti*. JUSSIEU, with many more recent authors (DE CANDOLLE, BROGNIART, A. GRAY, &c.), place it in *Droseraceæ*. ENDLICHER created an order for it, close by *Droseraceæ*, a view which PAYER held confirmed by observation on the evolution of the flower. BATSCH, DON, RŒPER, & LINDLEY put it in *Hyperuineæ*, or at least close by. BARTLING holds it near to *Tamariscineæ*, and REICHENBACH to *Gentianeæ*. J. E. SMITH, R. BROWN, LINDLEY (at first), ROYLE & PLANCHON have thought *Parnassia* allied to *Saxifragaceæ*." (J. G. AGARDH. *Theor. Syst. Pl.*, 80). This author himself considers *Parnassieæ* as perfected *Podostemeæ*, leading up to the symmetrical *Lentibularieæ*.

1 ENDL., *Gen.*, 812.

2 DON, in *Edinb. N. Phil. Journ.*, Oct., 1828 (*Galacineæ*).—DC., *Prodr.*, vii. 777.—LINDL., *Veg. Kingd.*, 451.—"*Francoaceæ* are herbaceous *Stachyureæ*. *Stachyurus* quite recals *Ribes* in habit, *Francoa* in flower." (AG., *Theor. Syst.*, 152, t. 12, fig. 16.)

3 Alternate in *Cardiandra*, sometimes subverticillate in *Broussaisia*.

4 *Prodr.*, iv. (1830), 13, trib. 4.

5 *Veg. Kingd.* (1846), 567, ord. 215.

6 GAUDICH., *Voy. Freycin.*, *Bot.* (1826).

7 SIEB. & ZUCC., *Fl. Jap.* (1835).

8 In *Journ. Linn. Soc.*, ii. (1857).

9 *Fl. Cochinch.* (1790).

10 *Gen.* (1789), 325.

11 *Gen.*, 431.

12 In *Edinb. New Philos. Journ.*, i. (1826), 133.

accepted by DE CANDOLLE[1] and ENDLICHER,[2] but left by them in the neighbourhood of *Myrtaceæ*; while LINDLEY[3] in 1846 placed it in his alliance *Grossales*, between *Escalloniceæ* and *Barringtonieæ*. It then contained *Deutzia*, *Philadelphus*, and *Decumaria*. Latterly American botanists have added *Jamesia*,[4] *Fendlera*,[5] *Wipplea*,[6] and *Carpenteria*;[7] and we have since referred[8] to this group, as a link between it and the *Escallonieæ*, the genus *Pterostemon*, formerly classed with *Rosaceæ–Quillaieæ*. These eight genera have the following characters in common, linking them with *Hydrangeæ*: leaves opposite exstipulate;[9] stamens diplostemonous, or more numerous in oppositipetalous phalanges. Ovary inferior in half the genera, almost completely superior in the four new American genera enumerated above, where the receptacle is a shallow cupule; fruit capsular; seeds albuminous.

VIII. ESCALLONIEÆ.—A series formed of trees and shrubs, with alternate exstipulate simple leaves, often coriaceous, with glandular teeth. Flowers usually isostemonous. Receptacle more or less concave. Ovary wholly or partially inferior, with two or more complete or incomplete cells (12 genera). R. BROWN[10] made *Escallonieæ* a distinct order, to comprise *Anopterus* and several unpublished Australian genera; this order was adopted by LINDLEY.[11] DE CANDOLLE,[12] on the contrary, only made *Escalloniceæ* a tribe of *Saxifragaceæ*, comprising, besides *Escallonia*, the four genera *Itea*, *Forgesia*, *Anopterus*, and *Quintinia*.[13] LINDLEY added *Carpodetus* of FORSTER,[14] and *Choristylis* of HARVEY.[15] BENTHAM AND HOOKER[16] further add *Valdivia*,[17] inseparable from *Escallonia*, and *Argophyllum*,[18] which cannot be placed away from *Carpodetus*; besides *Polyosma*,[19]

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1 *Prodr.*, iii. (1828), 205.
2 *Gen.* (1840), 1186, ord. 264.
3 *Veg. Kingd.*, 753, ord. 289.
4 TORR. & GRAY, *Fl. N.-Amer.*, i. (1838).
5 ENGELM. & GRAY, *Pl. Wright*, i. (1848).
6 TORR., in *Wippl. Expl.*, *Bot.* (1854).
7 TORR., *Pl. Fremont.* (1857).
8 In *Adansonia*, ix. (1870).
9 Except in *Pterostemon*, where they are alternate, with ill-developed stipules. These characters further link *Pterostemon* with *Escallonieæ*.
10 In *Frankl. Voy.* (1824), 766; *Misc. Works*, (ed. BENN.), ii., 523 (*Escalloneæ*).
11 *Veg. Kingd.* (1846), 752, ord. 288 (*Escalloniaceæ*).
12 *Prodr.*, iv. (1830), 2, trib. i. (*Escallonieæ*).
13 A. DC., *Diss. ined.* (1830), ex DC., *Prodr.*, iv. 5.
14 *Char. Gen.* (1716), 33.
15 In *Hook. Journ.*, i. (1842).
16 *Gen.*, 632 (1865).
17 REM., in *C. Gay Fl. Chil.*, iii. (1854).
18 FORST., *Char. Gen.* (1776), 29.
19 BL., *Bijdr.*, 658 (1826).

long considered the type of a distinct group;[1] *Phyllonoma,*[2] long referred to *Celastraceæ,*[3] but differing therefrom in its parietal placentation; and lastly, *Berenice,*[4] in floral organization so closely resembling *Argophyllum* and *Carpodetus.* We have thought it right to add a little exceptional genus, *Stichoneuron,*[5] hitherto held a member of *Santalaceæ.*

IX. BREXIEÆ.—The genera *Brexia, Roussea,* and *Ixerba* (besides *Argophyllum*) were made by LINDLEY[6] into the distinct order *Brexiaceæ,* allied to *Cunoniaceæ, Celastraceæ,* and *Myrsineæ.* Since then the group has been made, like *Cunoniaceæ,* a tribe of *Saxifragaceæ.*[7] We considered in 1865[8] that the *Brexieæ* linked *Pittosporeæ* with *Saxifragaceæ,* and showed[9] that *Anopterus* must be placed in the same group as *Brexia;* and that *Ixerba,* except in the number of ovules, "has all the external characters and floral organization of a plurilocular *Pittosporum.*"[10] This series has the general characters of *Escallonieæ,* but with a free ovary, an almost perfectly hypogynous perianth and androceum, and a single style; hence we have referred to it the new genera, *Abrophyllum*[11] and *Cuttsia.*[12]

X. PITTOSPOREÆ.—Considered by us, in 1865,[13] as *Escallonieæ* with a superior dicarpellary gynæceum, an imbricate corolla, an isostemonous androceum, a dry or fleshy, free, many-seeded fruit, and indefinite seeds, containing a small embryo near the apex of usually hard albumen. *Pittosporaceæ* was made a distinct order by R. BROWN[14] in 1814, placed by him near *Dilleniaceæ* and *Polygalaceæ.* LINDLEY,[15] in 1846, made this group to comprise the eight genera that we retain, and placed it between *Vitaceæ* and *Olacaceæ.* ENDLICHER[16]

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1 *Polyosmeæ* BL., *Mus. Lugd.-Bat.,* i., 258 (1851). LINDLEY (*Veg. Kingd.,* 751) makes this genus a Grossulariad.

2 W., in *Rœm. et Sch. Syst. Veg.,* vi. (1820).

3 ENDL., *Gen.,* 1090. J. G. AGARDH. (*Theor. Syst.,* 315) makes this genus the type of *Dulongieæ,* of which he says: "they are perhaps nearest allied to *Helvingaceæ* and *Griselineæ.*

4 TUL., in *Ann. Sc. Nat.,* sér. 4, viii. (1857).

5 HOOK. F. & THOMS., in *Cat. Griff.* (1865).

6 *Veg. Kingd.,* 573, ord. 217 (ed. prior (1830), n. 95 (*Brexiaceæ*).—ENDL., *Gen.,* 823. —*Rousseaceæ* DC., *Prodr.,* vii. (1838), 521. AD. BRONGNIART [*Enum.* (1843), 72] places *Brexiaceæ* with doubt next to *Ericaceæ* and *Monotropa.*

7 In *Ann. Sc. Nat.,* sér. 4, viii. 158.

8 In *Adansonia,* v. 292.

9 *Loc. cit.* 290.

10 *Loc. cit.,* 294.

11 HOOK. F., *Gen.,* 647 (1865).

12 F. MUELL., *Fragm.,* v. 47 (1865).

13 In *Adansonia,* v. 286.

14 In *Flind. Voy., Bot.,* ii. 542; *Misc. Works* (ed. BENN.), i. 13.

15 *Veg. Kingd.,* 441, ord. 161.

16 *Gen.,* 1081, ord. 234.

placed it in his class *Frangulaceæ*; BENTHAM & HOOKER[1] between *Bixaceæ* and *Tremandreæ*.

XI. RIBESIEÆ.—Isostemonous Saxifragads, with a pulpy, fleshy, inferior fruit.[2]

XII. BAUEREÆ.[3]—Flowers 6–10-merous. Stamens some multiple of the petals (double or more). Ovary only inferior at its base. Capsule 2-celled, polyspermous leaves opposite, sessile, 3-foliolate. Lateral leaflets simulating broad stipules (1 genus).

XIII. CUNONIEÆ.—Trees or shrubs; leaves opposite[4] or rarely verticillate, simple 3–5-foliolate, or imparipinnate. Petals imbricate or absent. Flowers grouped in cymes, simple or compound racemes, or racemes of cymes (10 genera). R. BROWN[5] separated this group from *Saxifragaceæ* as a distinct order. A. L. DE JUSSIEU[6] only knew the two genera *Cunonia* and *Weinmannia*, which he placed as *genera* Saxifragis *affinia*. ENDLICHER[7] made the *Cunonieæ* a suborder of *Saxifragaceæ*, therein following DE CANDOLLE, who makes them a tribe of the order. He knew in 1830 five genera: *Caldcluvia* (*Dieterica*), *Weinmannia*, *Lamanonia* (*Belangera*), *Cunonia*, and *Ceratopetalum*.[8] LINDLEY,[9] following R. BROWN, admitted in 1846 a distinct order, *Cunoniaceæ*, comprising, besides the above, the nine genera: *Callicoma*, *Acrophyllum* (*Calycomis*), *Aphanopetalum*, *Schizomeria*, *Platylophus*, *Anodopetalum*, *Ackama*, *Gumillea*, and *Geissois*. Since then the following new genera have been made: *Spiræopsis*, by MIQUEL,[10] *Spiræanthemum* by A. GRAY;[11] *Gillbeea*[12] and *Davidsonia*[13] by F. MUELLER. We have, moreover, referred to this series the genus *Tetracarpæa* of J. HOOKER.[14]

XIV. CODIEÆ.—*Cunoniæ* with simple,[15] opposite, or verticillate leaves, possessing caducous stipules, and flowers in globular capitula (3 genera); thus serving as a link to *Liquidambareæ*, *Brunieæ*, &c.

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1 *Gen.*, 130, ord. 18.

2 *Grossularieæ* DC., *Fl. Fr.*, iv. (1804), 406, —*Grossulaceæ* MIRB., *Elem.*, ii. (1815), 897.—*Ribesiæ* A. RICH., *Elém.*, ed. i. (1823), ii. 487.—*Ribesiaceæ* ENDL., *Gen.*, (1839), 823, ord. 171.—*Grossulariaceæ* LINDL., *Veg. Kingd.* (1846), 750, ord. 287. — *Saxifragacearum* trib. *Ribesieæ* B. H., *Gen.*, 654.—*Cactorum* gen. J., *Gen.* (1789), 310.

3 H. BN., in *Adansonia*, vi. 9.—*Baueraceæ* LINDL., *Veg. Kingd.*, 569 (ed. prior, 1830, n. 40).

4 Alternate (?) in the single genus *Gumillea*.

5 In *Flind. Voy.*, *Bot.* (1814), 548; *Misc. Works* (ed. BENN.), i. 20.—DON., in *Edinb. N. Phil. Journ.* (June, 1830).

6 *Gen.*, 309.

7 *Gen.*, 817.

8 Without counting *Codia* and *Calliconia*, nor *Arnoldia* (synonymous with *Weinmannia*).

9 *Veg. Kingd.* (1846), 571, ord. 216.

10 *Fl. Ind.-Bat.*, i. p. i. (1855).

11 In *Unit. St. Expl. Exp.*, *Bot.*, 666 (1854).

12 *Fragm.*, v. 17 (1865).

13 *Op. cit.*, vi. 3 (1867).

14 In *Hook. Icon.*, t. 264 (1840).

15 Except in *Pancheria ternata*.

XV. BruniEæ.—Flowers isostemonous, often capitulate, rarely in compound spikes or racemes. Receptacle always concave. Ovary wholly or partially inferior, 1–3-celled; septa sometimes rudimentary or absent. Ovules usually definite (1, 2)[1] in each cell, descending, with the micropyle directed, before torsion,[2] upwards and inwards. Fruit dry, indehiscent, dicoccous, or tricoccous. Shrubs or undershrubs of often ericoid habit; leaves usually rigid acicular, tipped (like the sepals, bracts, &c.) by a blackish glandular apiculus. Stipules lateral small. This group was distinguished as an order by R. Brown[3] in 1818; it formed the subject of a monograph of Ad. Brongniart[4] in 1826, who included therein six of the genera which we have retained in our studies on the order.[5] The authors of the *Flora Capensis*[6] added to it in 1861 the genus *Lonchostoma*, which had been successively referred to *Thymeleæ* and *Retzieæ*.[7]

XVI. Hamamelideæ.—Flowers usually sessile, spicate or capitulate, hermaphrodite or polygamous; perianth simple or double, regular or unsymmetrical, or nearly absent. Anthers dehiscing by clefts or valves. Ovary inferior or superior. Ovules (1, 2–∞) like those of the *Bruinieæ*,[8] and presenting the same phenomenon of torsion. Fruit capsular. Seeds albuminous. Trees and shrubs with simple stipulate leaves (3 genera). This group was made by R. Brown[9] a distinct order in 1818, a course followed by all subsequent authors;[10] we referred it as a mere tribe or series to *Saxifragaceæ* in 1865.[11]

XVII. Liquidambareæ.—*Hamamelideæ*, with unisexual or polygamous, spicate or capitulate flowers, possessing an ill-developed perianth or none, and a corolla represented by narrow tongues (?) or absent. Ovarian cells multiovulate. Female receptacle concave. Fruit capsular. Trees with simple leaves (3 genera). A series raised to ordinal rank, and placed near *Amentaceæ* by Blume[12] under

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1 Their number is often above two in *Lonchostoma*.

2 See p. 382.

3 In *Abel's Voy.*, *Bot.* (1818), 374; *Misc. Works* (ed. Benn.), ii. 322.—DC., *Prodr.*, ii. 43.—Lindl., *Veg. Kingd.*, 785, Ord. 300.—Endl., *Gen.*, 805, Ord. 168.

4 *Mém. sur la Fam. des Bruniacées*, in *Ann. Sc. Nat.*, sér. 1, viii. 357, t. 35–38.

5 See *Adansonia*, iii. 318; v. 294.

6 Harv. & Sond., *op. cit.*, ii. 316.

7 Endl., *Gen.*, 669.

8 Which Gardner (in *Hook. Journ.*, i. 321) placed with *Hamamelideæ*.

9 In *Abel's Voy.*, *Bot.* (1818), 374; *Misc. Works* (ed. Benn.), i. 381; ii. 321, 334.

10 DC., *Prodr.*, iv. 267.—Endl., *Gen.*, 803, ord. 167.—Lindl., *Veg. Kingd.*, 784, ord. 299.—B. H., *Gen.*, 664, ord. 62.

11 In *Adansonia*, v. 297; vi. 12.

12 *Fl. Jav.*, *Balsamifl.* (1828).—Endl., *Gen.*, 289, ord. 98.—Ag., *Theor. Syst.*, 155.

the name of *Balsamifluæ*, and by LINDLEY[1] under the name of *Altingiaceæ*, but then restricted to the genus *Liquidambar;* while *Bucklandia*, in organization quite inseparable therefrom, has from its foundation as a genus[2] been placed with *Hamamelideæ*, as the type of a special tribe, among *Hamamelideæ*.

XVIII. PLATANEÆ.—Flowers unisexual; capitate. Perianth rudimentary. Stamens or carpels of variable number in each flower. Carpels free; ovary uniovulate (rarely biovulate). Ovules descending, suborthotropous. Fruit composed of achenes. Seeds albuminous. Trees; leaves alternate; stipules united into a sheath embracing the branch, with the axillary bud hidden in a cavity at the dilated base of the petiole. *Platanus*, the sole genus of this series, was long placed with *Amentaceæ*[3] or *Urticeæ*.[4] Only in 1826 was it considered the type of a distinct order.[5] In 1843 AD. BRONGNIART[6] placed it, with doubt, as a distinct family, before *Balsamifluæ*, in his class *Hamamelineæ*. We think that, like the last-named family, it should form a tribe or series of the order under consideration.

XIX. MYOSURANDREÆ.—Flowers amentaceous, unisexual, achlamydeous. Two genera, one (*Myosurandra*) with free, the other (*Myrothamnus*) with monadelphous stamens. Carpels free, pluriovulate. Leaves opposite at base, forming a sheath, which completely envelopes (without adhesion) the internode above their insertion, and bears on its upper edge stipuliform appendages.

XX. DATISCEÆ.—Flowers diœcious or polygamous, amentaceous, or grouped in axillary racemes or cymes. Male receptacle convex. Female receptacle concave, enveloping the inferior one-celled ovary with pluriovulate parietal placentas. Fruit capsular. Seeds albuminous or exalbuminous. Leaves alternate, simple or pinnate, exstipulate. The genus *Datisca* was made in 1826[7] the type of an

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1 *Veg. Kingd.*, 253, ord. 79. He has also called them *Balsamaceæ*. They are sometimes called *Styracifluæ*.

2 R. BR., in *Cat. Wall.* (1828–1849); *Misc. Works* (ed. BENN.), ii. 534. B. CLARKE has also shown in a special memoir [in *Ann. and Mag. Nat. Hist.* (1858), 100–109] that *Sedgwickia* (syn. of *Altingia*) is a Hamamelid, as GRIFFITH thought, and inseparable from *Liquidambar*.

3 ADANS., *Fam. des Pl.*, ii. 377 (*Castaneæ*).—J., *Gen.*, 410 (*Amentaceæ*).—ENDL., *Gen.*, 289 (*Julifloræ*). — A. JUSS., *Taxon.* (1848), 53 (*Amemtaceæ*, ord. *Plataneæ*).

4 LINDL., *Veg. Kingd.*, 272, ord. 89.

5 LESTIB., *Elém.*, 526 (*Plataneæ*).—DUMORT., *Anal.* (1829), 11.

6 *Enum.*, 109; *Fam.*, 231 (?).

7 R. BR., in *Denh. & Clapp. Narr.*, App., 25.—LINDL., *Introd.*, ed. 2, 82; *Veg. Kingd.* (1846), 316, ord. 106.—ENDL., *Gen.*, 897, ord.

order placed near *Cucurbitaceæ*, *Cactaceæ*, *Crassulaceæ*, and *Saxifragaceæ*. We place it in the last, forming a series which links the order to the series *Saurureæ* in *Piperaceæ*, and to *Urticaceæ*. The genus *Tetrameles* was added in 1826,[1] and *Octomeles* in 1860.[2]

In 1846 LINDLEY estimated the number of species in the genera that we admit in this order at 766.[3] BENTHAM AND HOOKER at the present day admit in their *Genera* some 717, thus distributed: *Saxifragaceæ* proper 542; *Penthoreæ* 2; *Hamamelideæ* 30; *Bruniea* 40; *Pittosporeæ* 90; *Datisceæ* 4.[4] To give the geographical distribution in detail is here impossible; for in no region of the globe are the *Saxifrageæ* unrepresented. They are fewest in the Tropics, and in South Africa and Australia. But these are the chief localities for *Cunonieæ*, which also occur in numbers in all hot countries, chiefly represented by species of *Weinmannia*. *Cunonia*, formerly restricted to the Cape, is also found in abundance in New Caledonia. In America the numerous species of *Weinmannia* extend northwards some way into Mexico, and southwards into the south of Chili; and in the Old World, as far as New Zealand and the Cape. The *Escallonieæ* are almost entirely confined to South America, especially the genus *Escallonia*, which has not been found elsewhere. The *Hydrangeæ* abound in the temperate regions of Asia and America; and SIEBOLD & ZUCCARINI thought that only two species of *Hydrangea* belonged to the Northern Hemisphere.[5] *Philadelpheæ*, *Saxifrageæ*, *Datisca*, and *Ribes* comprise the only types found in Europe. They are numerous in Japan, Temperate India, and North America. The series *Penthoreæ* is represented by one species in China, and another in North America. The only known *Cephalotus*, and the whole genus *Bauera* are Australian. The *Brunieæ* are all natives of South Africa. The *Hamamelideæ*, widespread in tropical[6] and temperate Asia, South Africa, and North America, were hitherto

184.—AD. BR., *Enum.*, 106, fam. 219.—B. H., *Gen.*, 844, ord. 76.

[1] R. BR., *loc. cit.*; *Misc. Works* (ed. BENN.), i. 285.

[2] MIQ., *Fl. Ind.-Bat.*, Suppl., 336.

[3] Namely: *Saxifrageæ*, 310; *Cunonieæ*, 100; *Hydrangeæ*, 45; *Penthoreæ*, 2; *Cephaloteæ*, 1; *Parnassieæ*, 12; *Hamamelideæ*, 15; *Brunieæ*, 66; *Philadelpheæ*, 53; *Escallonieæ*, 60; *Brexieæ*, 6; *Pittosporeæ*, 78; *Francoeæ*, 5; *Altingieæ*, 3; *Plataneæ*, 6; *Datisceæ*, 4.

[4] We must add five species for *Plataneæ*, the number adopted in the most recent publications on this group.

[5] True, the South American *Cornidias* had not yet been recognised as *Hydrangeas*.

[6] Including the one species of *Rhodoleia* from Sumatra.

thought to be unrepresented in Australia.[1] The series *Liquidambareæ* is represented by *Bucklandia* in India and Sumatra, by *Liquidambar* in America, Asia, and Malaysia. *Brexia* and *Roussea* are restricted to the Mascarene Islands and Madagascar; but the other genera of *Brexieæ* represent it by some species in Australia and Tasmania. All the *Francoeæ* are Chilian; the *Myosurandreæ* are confined to the Cape and the islands off the east coast of Tropical and South Africa; and the *Codieæ* are exclusively Oceanian. The *Plataneæ* are only found in North America and Mediterranean Asia. Of the four known *Datisceæ* one alone is North American; the others belong to South-eastern Europe, West and Central Asia, India, and the Indian Archipelago. The *Pittosporeæ* are all Australian, excepting the genus *Pittosporum*, which is also found in all hot countries of the Old World, extending obliquely from the south of Africa to the north-east of China. The *Ribesieæ* inhabit the temperate regions of Europe, Asia, and North America, Mediterranean Europe, and the Andes of South America.

An order of the size and constitution of this must necessarily present numerous affinities.[2] Some of these are so close that it is extremely difficult to distinguish *Saxifragaceæ* by any absolute characters from several other natural orders, such as *Rosaceæ*[3] and *Crassulaceæ*,[4] as we have shown in treating thereof. *Astilbe*, on the one hand, *Bauera*, *Eucryphia*, and *Pterostemon*[5] on the other, link *Saxifragaceæ* and *Rosaceæ*, the latter being distinguished from the former by its general (though not constant) lack of albumen. By *Philadelphus*, *Argophyllum*, and *Carpodetus*, on the one hand, and *Cassipourea*, *Anisophyllea*, and *Crossostyles*, on the other, the order *Saxifragaceæ* is linked to *Myrtaceæ*, *Rhizophoreæ*, and *Melastomaceæ* respectively; by *Thamnea*, to *Memecyleæ*;[6] by *Fendlera*, *Raleighia*, *Abatia*, and *Crypte-*

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[1] The existence of the plant we have provisionally named *Osbrearia australiana* (in *Adansonia*, x. fasc. 4) was then unknown. Though still but very imperfectly known, it seems to us a *Hamamelid* with a partially inferior ovary, a capsule dehiscing into two emarginate valves, and numerous flowers in long spikes, terminating branches covered with alternate simple entire glabrous lanceolate leaves.

[2] For details on these points we refer to our *Observations sur les Saxifragées* (in *Adansonia*, v. 282; vi. 1).

[3] See above, i. 444.

[4] See above, iii. 317.

[5] See *Adansonia*, ix. 245.

[6] See *Adansonia*, iii. 329.

ronia, to *Lythrariaceæ*; by *Parnassia*, to *Droseraceæ*; by *Ribes*, to *Cactaceæ* and *Ficoideæ*; by *Donatia*, to *Stylideæ*;[1] by many of the *Saxifrageæ* with a superior ovary to *Hypericaceæ*,[2] and even to *Gentianaceæ*, which in certain cases are only distinguished by monopetaly; by *Hamamelideæ* and *Plataneæ*, to most of the groups of *Amentaceæ*,[3] to *Cornaceæ*, *Helwingieæ*, *Alangieæ*, *Halorageæ*, and *Onagrarieæ*;[4] by *Phyllonoma* and *Choristylis* to *Celastraceæ* and *Rhamnaceæ*; by *Stichoneuron* to *Santaleæ*;[5] by *Brexieæ* and *Pittosporeæ* to *Brixaceæ*, *Homalieæ*, and *Samydeæ*; and by *Hydrangeæ* to *Sambucineæ*. The relations formerly noticed by us between *Escallonieæ* and *Pittosporeæ* lead to other affinities of the *Saxifragaceæ*. "*Pittosporum*," as we observed, "has alternate exstipulate leaves; regular hermaphrodite pentamerous flowers; a nearly always polypetalous corolla, imbricated in the bud; five alternipetalous stamens, with introrse anthers; a glandular disk below the ovary; and inside this are either two parietal placentas advancing towards each other and sometimes touching, or else two quite separate cells with axile placentation; a capsular fruit; and albuminous seeds. All these characters also occur in *Escallonia*, but this genus has an inferior ovary, the former a superior one. Hence we may say that *Escallonia* is *Pittosporum*, with its receptacle concave instead of convex; or that *Pittosporum* stands to *Escallonia* in the same relation as the Saxifrages with a superior ovary to those with an inferior one. Now we know that both these forms are left not merely in the same order, but in the very same genus, and that it would be impossible reasonably to do otherwise. Now, apart from *Pittosporum*, the other genera of its family have more often a one-celled ovary with parietal placentation than a plurilocular ovary, this character yet being here of no great apparent importance, for it is not constant in the several species of a single genus." The orders grouped around *Pittosporeæ* by the majority of authors possess most of the characters we have noticed in the series; thus they are linked indirectly with *Saxifragaceæ*. We

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[1] B. H., *Gen.*, 629.

[2] *Carpenteria*, still ill known, seems also to be very near *Hypericaceæ*.

[3] Not only in characters of habit and foliage, but in the intimate structures of the gynæceum, do the *Coryleæ* represent, as we shall see, a reduced type of certain *Hamamelideæ*, with apetalous diclinous flowers. We may add that the latter are often amentaceous.

[4] See *Adansonia*, vi. 10.

[5] See p. 355.

have mentioned *Celastraceæ* and *Rhamnaceæ*, which are so closely allied to one another. Now-a-days "it is impossible, after all efforts to find on thorough analysis more than two differences between these two groups: the position of the stamens with respect to the petals, and the situation of the raphe. Thus the order *Saxifragaceæ* is allied to *Rhamnaceæ* and *Celastrineæ*, to the former by *Bruniaceæ*, formerly classed in *Rhamneæ*, and now made *Hamamelideæ* by several authors; to the latter by *Dulongieæ* and several allied genera which were formerly ascribed to *Celastrineæ*, and differ from *Saxifrageæ* in no essential point; and at the same time by *Brexiaceæ* and *Pittosporeæ*, as we have just shown." Others have approximated *Pittosporeæ* to *Violariaceæ*, *Berberidaceæ*, and *Brixaceæ*, which have the same placentation as in most *Saxifragaceæ*. *Berberidaceæ*, among others, by its free carpels approaches *Dilleniaceæ*, to which *Tetracarpæeæ* was formerly referred, and *Ranunculaceæ* and *Rosaceæ*, whose affinities with *Cephalotus* we have noticed. We have also shown that *Brexieæ* link most closely *Escallonieæ* and several other small series of this order with the little group *Pittosporeæ*; and the series *Brexieæ* itself has been placed beside *Ericaceæ* by AD. BRONGNIART, and *Berberidaceæ* by AGARDH. *Ixerba*, as well in vegetative organs as in flower, is as near to certain species of *Pittosporum* as to the other genera of its own series, *Brexieæ*. It has also been said that between *Brexieæ* and *Pittosporum* "the only essential difference lies in the number of ovary cells, which is the same as that of the petals in *Brexieæ*, while most *Pittosporeæ* have a dicarpellary gynæceum. But this difference disappears in the 4–5 carpellary species of *Pittosporum*." Now, the approximation we have shown between the *Brexieæ* and *Pittosporeæ*, on the one hand, and the *Saxifrageæ*, with a superior ovary, on the other, leads us to the further affinity of the latter with *Celastraceæ* and *Rhamnaceæ*.[1]

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[1] From these numerous affinities it follows that not one of the characters by which we distinguish the several orders of Dicotyledons is constant in this one. The same may be said of the anatomical structure, which varies with the series or genus under examination. In this respect *Cunonieæ*, *Hydrangeæ*, *Pittosporeæ*, *Escallonieæ*, *Brexieæ*, *Bauereæ*, &c., require differential study. The Planes have sometimes been taken for an example of the structure of the wood in Dicotyledonous trees. (See MIRB., *Elém. Phys. Vég.* (1815), t. 9, i.—LINK., in *Ann. Mus.*, xix. (1812), 340, icon. —HENFREY, *Microsc. Dict.*, art. *Wood*; *Elem. of Bot.*, 534, fig.—SCHACHT, *D. Baum*, 200.—A. GRAY, *Introd. to Bot.* (1858), 15.—DUCHTR., *Elém. de Bot.*, 160. In this genus especial notice has been taken of the mode in which the bark peels off (see p. 399, note 5); this depends on the presence of sheets of periderm between suberous plates of unequal thicknesses. The latter

This order, large as it is, contains but few useful plants. True, a large number are cultivated to adorn our conservatories, gardens, parks, and public places; for foliage are planted the so-called "Oriental" and "Occidental" Plane-trees, referred by several authors to one and the same species,[1] and more rarely various species of *Liquidambar*, *Hamamelis*, *Parrotia*, and *Fothergilla*; for their elegant flowers many Saxifrages, especially suitable to rockeries, *Philadelphus* (*Syringa* of gardeners) and *Deutzia*,[2] *Astilbe*, *Itea*, *Heuchera*, *Tiarella*, *Tellima*, &c., *Francoa*, numerous *Hydrangeas* (especially the *Hortensia*[3] of gardeners, with its large whitish pink or bluish sepals), and in the conservatory *Cunonia capensis*, several species of *Weinmannia*, *Escallonia*, *Brunia*, and *Bauera*, *Callicoma serratifolia*, *Ceratopetalum gummiferum*, *Abrophyllum ornans*, and most of the *Pittosporeæ*, the superb *Rhodoleia chinensis* for the coloured bracts surrounding its flower, and *Cephalotus follicularis* for its curious pitchers. Many species of the genus *Ribes* (Fr., *Groseillier*) are prized for their fruits.[4] Those of *Billiardera mutabilis* are also edible and of pleasant acidulous taste. Otherwise alimentary plants are very rare in this

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come off when the subjacent layer of periderm is destroyed with age. The *Liquidambareæ*, again, have a peculiar structure (GRIFF., in *As. Res.*, xix. 95, 99), also found in many *Hamamelideæ*. In *Bucklandia* and *Sedgwickia* the woody fibres bear areolate pores, recalling those of Conifers. OLIVER (in *Trans. Linn. Soc.*, xxiii. 83; *Stem in Dicot.*, 19; in *Nat. Hist. Rev.*, ii. 316), has examined, besides the preceding genera, *Rhodoleia*, *Trichocladus*, *Hamamelis*, *Sycopsis*, *Eustigma*, *Distylium*, and *Corylopsis*. He finds a great uniformity of structure. He ascribes the disks of the parenchyma to the presence of minute lenticular cavities between the adjoining wood-cells; the canals opposed on each side to these cavities are almost invariably elongated laterally, though sometimes nearly circular and very minute. The wood is traversed by numerous vessels, which are generally transversely barred. The medullary rays are numerous and narrow. In *Bucklandia* the markings on the parenchyma are very distinct. The medullary rays are very numerous, usually one cell in diameter; vertically they are very variable in extent, commonly presenting 10–12 superimposed cells, though I have counted about 45. The wood of the *Ribesieæ* has been studied by HANSTEIN (*Ueb. den Zusammenh. d. Blattstell. mit dem Bau des Dic. Holzringes*, in *Pringsh. Jahrb.*, i. t. xvi. 10).

[1] Detrimental effects have been ascribed to the Plane-trees through the introduction of the down that comes off from the shoots in spring, or the long hairs accompanying the fruits, into the air-passages of Man.

[2] *D. scabra* (THUNB., *Nov. Gen.*, 19, 21; *Ic. Fl. Jap.*, 185;—*Joro*, *Utsugi* KÆMPF., *Amœn. Exot.*, 584) owes its name to its rough leaves, which are said to be used by the Japanese labourers for polishing.

[3] *H. hortensia* DC., *Prodr.*, iv. 15, n. 12.—*H. hortensis* SM., *Ic. Pict.*, i. t. 12.—*Primula mutabilis* LOUR.—*Viburnum serratum* THUNB.—*V. tomentosum* THUNB.—*Hortensia opuloides* LAMK.—*H. speciosa* PERS.

[4] Especially the Gooseberry (*Ribes Grossularia* L., *Spec.*, 291;—*R. Uva crispa* L., *Spec.*, 292), the Red and White Currant (*R. rubrum* L., *Spec.*, 290), the Black Currant (*R. nigrum* L., *Spec.*, 291;—*R. olidum* MŒNCH, *Meth.*, 683). And, more rarely, *R. reclinatum* L., *spicatum* ROBS., *petræum* WULF., *alpinum* L.; in Siberia *R. procumbens* PALL. and *fragans* PALL.; and in North America *B. floridum* HEIST. (*R. pensylvanicum* LAMK.), *aureum* PURSH (*Chrysobotrya revoluta* SPACH), *Cynobasti* L., *oxyacanthoides* L., *Menzisii* PURSH, *hirtellum* MICHX., *divaricatum* DOUGL., *magellanicum* POIR. (ROSENTH., *Syn. Pl. Diaphor.*, 580, 1140). The fruit of *R. inebrians* LINDL. (*Cerophyllum inebrians* SPACH) is considered poisonous and an emetic.

order. *Saxifraga crassifolia* and *Hydrangea Thunbergii*[1] may be used instead of Tea. The medicinal properties[2] are not very noteworthy in this order. It contains several astringent plants: *Heuchera americana*,[3] the root of which is used in the United States; *Chrysosplenium alternifolium*,[4] considered a slight tonic; and several Peruvian *Weinmannias*, which may be used to tan hides, and are sometimes mixed with Cinchona barks[5] on account of their astringency; the Indian species are also astringent. The *Francoas* have similar properties; the Chilians use their juice as a refreshing sedative and antiphlogistic; the roots are used for dyeing black.[6] *Tetilla hydrocotylæfolia*[7] is acidulous and of remarkable astringency. Its petioles are used in dysentery. The *Pittosporeæ* are all aromatic, resinous, and bitter, but hardly seem to be used at all.[8] The Hamamelids are also astringent. *H. virginica* is used in America for astringent lotions, gargles, &c., owing to the tannin contained in its leaves and bark.[9] It is also said to contain an essential oil. The Oriental Plane is also astringent, for even the ancients regarded it as good to stanch bleeding and cure chilblains, burns, ophthalmia, &c. A decoction of the roots of the Plane is used in America in the treatment of ulcers and dysentery. People have gone so far as to recommend it as a substitute for cinchona, and recommend it (in the kingdom of Naples) in cholera.[10] All the parts of *Myosurandra moschata* have a very aromatic and persistent smell of musk.[11] Several species of *Ribes*, notably the Black Currant, are tonic and stimulant, bearing glands on their flowers which secrete an excitant scented substance. The leaves of the *Escallonias* have often a very marked scent of Melilot;

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[1] It is named Celestial Tea (*Amatsja*; Fr., *Thé du ciel*) in Japan. Its ally (*Platycrater arguta* SIEB. & ZUCC.) serves the same purposes. The leaves of *Philadelphus* taste of Cucumber.

[2] ENDL., *Enchirid.*, 410.—LINDL., *Fl. Med.*, 273.—ROSENTH., *Syn. Pl. Diaphor.*, 576, 1140.

[3] L., *Spec.*, 328.—TORR., *Fl. N.-Amer.*, i. 290.—*H. viscida* PURSH. Its astringency is very great, whence its name Alum-root. Several other species have similar properties (ROSENTH., *op. cit.*, 578).

[4] L., *Spec.*, 569.—DC., *Prodr.*, iv. 48, n. 1 (vulg. *Dorine, Cresson de rocher, C. doré, Saxifrage dorée, Hépatique dorée, Herbe à l'archamboucher*). It is said to be aperient and slightly diluent; its leaves are eaten in salad and soup in the Vosges. *C. oppositifolium* L. (vulg. *Hépatique des marais, Cresson de rocher*) has the same properties.

[5] Especially *W. ovata* CAV. (*Ic.*, vi. 45, t. 566), *elliptica* H. B. K. and *Balbisiana* H. B. K. The last especially has been fraudulently substituted for Cinchona. In the Antilles the name of *Tanrouges* has been given to *W. hirta* Sw. and *glabra* L. F., which also possess astringent, tanning barks, and exude a sort of gum.

[6] *F. sonchifolia* is used in piles (ROSENTH., *op. cit.*, 576).

[7] Vulg. *Culantrillo, Teta de capra.*

[8] In Australia the natives, when famished, are said to eat their seeds, bathed in a viscid matter of disagreeable taste (ENDL., *Enchirid.*, 572).

[9] Its seeds are said to be edible.

[10] CAZ., *Pl. Méd. Indig.*, ed. 3, 861.

[11] H. BN., in *Adansonia*, ix. 237.

some species are considered tonics in Peru.[1] Several European Saxifrages have superficial glands, whence exudes a viscid matter, said to be acrid and irritant.[2] In Australia and South America certain *Cunonieæ* afford gummy secretions.[3] But the plants of this order most noted for their products are unquestionably the Liquidambars.[4] In America *L. styraciflua*,[5] a fine tree from the United States and Mexico, affords two kinds of balm[6] on incision: "one liquid and transparent, like an oil; the other soft, white, and opaque, like Burgundy pitch."[7] The latter resembles balsam of Tolu, and is sometimes used to adulterate it, but is distinguished by its acrid and markedly bitter taste. In Asia Minor grows a smaller species, *L. orientale*,[8] which several authors hold yields on incision the liquid styrax or storax of pharmacy. This opinion, though disputed,[9] must, as it would now appear, be adopted.[10] On the coast opposite to the Isle of Rhodes the outer bark of this tree is removed and kept in parcels for fumigation. The inner bark is boiled in water till the resinous parts rise to the top; they are then pressed in horsehair bags to extract what is known as oil of storax, or of *Buchuri*, which smells of vanilla, and enters into several ointments and plasters. *L. altingia*,[11] a gigantic tree from Java, has also been held to supply the

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[1] Chiefly *E. rubra* PERS., *resinosa* PERS., *myrtilloides* L. FIL. (ROSENTH., *op. cit.*, 579). The leaves and bark of *Philadelphus* and *Brexia* are also considered tonic. Other Saxifragads are odoriferous. *Itea rosmarinifolia* POIR., in Cochin China, contains an aromatic essential oil; and in Europe the so-called Syringas flower smells of Jasmine, and has sometimes been used to make scent.

[2] The lithontriptic virtues of the Saxifrages need demonstration. Their generic name may seem to imply them, but it is rather due to the way they grow upon rocks. It has been thought that these have been disintegrated by the slightly acid juice of several species. Formerly the leaves of *S. granulata* L. were prescribed for stone in the bladder. *S. tridactylites* L. (figs. 354–358) was formerly used in liver complaints. *S. bronchialis* L., *bulbifera* L.,&c., were formerly thought astringent and pectoral. *S. cotyledon* L., *tridactylites* L., &c., are sometimes eaten as vegetables (ROSENTH., *op. cit.*, 577).

[3] Especially *Ceratopetalum gummiferum*, whose gum is reddish.

[4] GUIB., *Drog. Simpl.*, ed. 6, ii. 304, fig. 432, 433.—LINDL., *Fl. Med.*, 321.—ENDL., *Enchirid.*, 176.—ROSENTH., *op. cit.*, 203.

[5] L., *Spec.*, 1418.—DUHAM., *Arbr.*, ed. nov., ii. t. 10.—MICHX., *Arbr.*, iii. 194.—A. GRAY, *Man.*, 148.—CHAPM., *Fl. S. Unit. St.*, 157.—A. DC., *Prodr.*, xvi. p. ii. 157, n. 1.—*L. macrophylla* ŒRST., *Amer. Centr.*, t. 10.—*Xochiocotzo* HERNAND., *Thes.*, 56 (vulg. *Sweet Gum, Copalm, Balsam tree*).

[6] Named by GUIBOURT "*Baumes liquidambar*."

[7] GUIB., *op. cit.*, 305.

[8] MILL., *Dict.*, n. 2.—SPACH, *Suit. à Buffon*, xi. 86.—DUHAM., *Arbr.*, ed. nov., ii. 44.—LOUDON, *Encycl.*, 934, fig. 1739.—A. DC., *Prodr.*, n. 2.—*L. imberbe* AIT., *Hort. Kew.*, ed. 2, iii. 365.—*Platanus orientalis* POCOCK, *Trav.*, ii. t. 89.

[9] PEREIRA, *Elem. Mat. Med.*, ed. 4, ii. p. i. 336.

[10] HANBURY, *On Storax* (in *Pharm. Journ.*, xvi. 417, 461).

[11] BL., *Fl. Jav.*, fasc. xvii. 6, t. 1, 2.—A. DC., *Prodr.*, n. 3.—*L. Altingiana* BL., *Bijdr.*, 527.—*L. Rasamala* BL., *Cat. Hort. Buitenz.*, 6.—*Altingia excelsa* NORONH., in *Bat. Verh.*, v. 1.—*Sedgwickia cerasifolia* GRIFF., in *As. Res.*, i. 98, t. 15, 16 (*Rasamalla, Rosamallas, Cotter-Mija*).

liquid storax of commerce on incision; indeed, it does yield a semi-fluid odoriferous resin, but this would seem to be not very abundant, and to be only employed as a balsam in the country, without ever being imported into Europe. The *Datiscas* have well marked properties. *D. cannabina* is said to be a bitter, nauseous herb, laxative and emetic, recommended in Italy in the treatment of intermittent fevers, gastric complaints, scrofula, &c.[1] Its root contains a sort of fecula called *datiscine*, closely allied to inuline.[2]

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[1] ENDL., *Enchirid.*, 460.

[2] The timber of several arborescent Saxifragads is more or less used, that of the Planes here and in America, by the carpenter, cabinet-maker, musical instrument-maker, coach-builder, &c., being made into furniture; *Liquidambar orientale* and *Altingia* in Asia; *Cunonia capensis* at the Cape. Several *Hamamelideæ* have useful wood: *Hamamelis*, *Parrotia*, &c. [For details of the fertilization of the flower in this order see MÜLLER, *Befrucht.*, 92–95, (*Parnassia*) 144.

GENERA.

I. SAXIFRAGEÆ.

1. **Saxifraga** T.—Flowers usually hermaphrodite; receptacle more or less concave, generally disciferous within. Sepals usually 5, free or slightly connate at base, equal or very rarely unequal, imbricate, finally erect or patent. Petals 5, alternating with sepals, rarely subsimilar to them, equal or very rarely unequal, sometimes glanduliferous or fimbriate at base, imbricate or rarely contorted. Stamens 10, 2-seriate (or more rarely 5, alternatipetalous) inserted more or less perigynously with petals; filaments free; anthers 2-celled, often 2-dymous, of introrse or lateral dehiscence. Germen free, or partly or sometimes wholly inferior, surrounded by a disk to a variable height at base, or sometimes laterally; carpels 2 (very rarely 3, 4), free or more or less highly connate into 1- or 2-celled germen; placentas parietal or inserted in internal angle, at apex 2-lobed to a variable height; ovules ∞, anatropous ∞-seriate; carpels terminating in styles more or less elongated, often recurved at apex, truncate or capitate, stigmatose. Fruit dry capsular, 2-valved from apex within between beaks, or formed of 2 follicles, longitudinally dehiscent within. Seeds ∞, small smooth or rugose; albumen fleshy; embryo straight axile, subequal to albumen or shorter.—Perennial herbs, more rarely annual, sometimes frutescent at base; leaves alternate or opposite; inferior often rosulate; petiole generally straight at base; stipules 0; flowers rarely solitary, generally cymose; cymes (sometimes 1-parous) grouped in a simple or branching raceme, often corymbiform (*Temperate, Alpine, and Arctic regions of Northern Hemisphere, more rarely Australia, America, and South Africa*). See p. 323.

2. **Chrysoplenium** T.—Receptacle shortly obconical or urceolate; leaves of calyx 4, or more rarely 5, short, obtuse, imbricate. Corolla 0. Stamens 8–10 (or more rarely 4, 5, alternipetalous); filaments free short, inserted round epigynous crenulate disk; anthers basi-

fixed, 2-dymous or subsagittate introrse 2-rimose. Germen immersed in receptacle, 1-celled; placentas 2, or more rarely 3, parietal broad; ovules ∞; styles 2, 3, short, recurved, stigmatose at apex. Capsule partly superior, cruciately gaping at equal or unequal-lobed apex. Seeds ∞, oblong or compressed, smooth outside, hairy or muricate, albuminous.—Annual or perennial herbs; leaves alternate or opposite, petiolate exstipulate simple crenate; flowers small axillary or terminal, solitary or in 1- or 2-parous cymes (*Europe, Northern and Middle Asia, Temperate North and South America*). See p. 327.

3. **Tellima** R. Br.—Receptacle subcampanulate, broadly inflated or dilated. Sepals 5, inserted at top of receptacle, valvate. Petals as many, inserted with calyx in throat of receptacle, entire, 3-fid or pinnatifid, sessile or unguiculate, afterwards reflexed or revolute. Stamens 10, 2-seriate, inserted with perianth, small included; anthers introrse 2-celled. Germen at base adnate to receptacle, half superior, 1-celled; styles 2, or more rarely 3, short, stigmatose at angulate or thickened apex; placentas 2, or more rarely 3, parietal ∞-ovulated. Capsule partly inferior, included membranous at apex, 2, 3-beaked, 2, 3-valved. Seeds ∞, small albuminous.—Erect herbs; leaves alternate lobed or dentate; stipules 0, or adnate to base of petiole; flowers nutant in elongate terminal racemes; pedicels bracteolate (*North West America*). See p. 327.

4. **Mitella** T.—Receptacle shortly and openly cupulate, beyond dilated germen; sepals 5, inserted in mouth, spreading, imbricate, or finally valvate. Petals 5, inserted in throat, 3-fid or pectinate-pinnatifid elongated slender; laciniæ linear-capillary. Stamens 10 2-seriate, or 5 sometimes alternating, sometimes (*Mitellopsis*) opposed to petals; filaments short; anthers introrse 2-celled. Germen partly inferior, 1-celled; styles 2, short, stigmatose at capitellate apex; placentas parietal 2, ∞-ovulate. Capsule exserted at apex, 2-valved. Seeds ∞, small, erect, or subtransverse; testa shining.—Herbs; rhizome perennial; leaves cordate, lobed or crenate; stipules adnate to long petiole; flowers remote usually secund and nodding, in thin elongated racemes, scapiform, and bare or 1-leafed at base (*North America, North Eastern Asia*). See p. 328.

5. **Heuchera** L.—Receptacle campanulate. Sepals 5, 6, sometimes unequal, imbricate. Petals 5, 6, or 0, inserted in mouth of receptacle, entire. Stamens inserted and alternate with petals; filaments short or elongated; anthers frequently exserted, 2-celled; dehiscence marginal or introrse. Germen altogether or to a great extent entire, 1-celled; styles 2, elongated, stigmatose at apex; placentas 2, parietal ∞-ovulate. Capsule inferior, apex 2-valved between styles. Seeds ∞, hispidulous or muricate.—Herbs; rhizome thick perennial; branches annual scapiform; leaves radical broadly cordate or orbiculate, lobate or crenate; stipules membranous adnate to long petiole; flowers bracteate, in spikes or simple or branching racemes (*Temperate and Frigid North and South America*. See p. 328.

6. **Tiarella** L.—Receptacle shortly cupulate; sepals and petals entire 5, inserted at margin. Stamens 10, 2-seriate, inserted with petals; filaments free elongated; anthers 2-celled introrse. Germen free, inserted in bottom of receptacle, 2-fid at apex; lobes open, soon unequal, with few seeds at base, terminating in slender styles; placentas 2, parietal at base of cell, ∞-ovulate. Capsule membranous free, 1-celled, broadly 2-valved at apex between styles; valves folliculiform gaping, very unequal, few-seeded at base. Seeds albuminous; testa crustaceous smooth.—Slender herbs; rhizome perennial; leaves alternate, simple or 3-foliolate; stipules small, adnate to long petiole; flowers in terminal, simple and branching racemes (*Temperate North America, Himalaya*). See p. 328.

7. **Boykinia** Nutt.—Receptacle suburceolate very concave, adnate to ovary and slightly produced beyond. Sepals 5, 3-angular, inserted at mouth, valvate. Petals 5, alternate, a little longer, subspathulate, glandular-dilated at insertion. Stamens 5, alternipetalous; filaments short free; anthers introrse 2-rimose apiculate. Germen inferior, 2- or more rarely 3-celled; styles 2, or 3, short, stigmatose at apex; ovules ∞, inserted on axile placenta. Capsule 2, 3-celled; beaks 2, 3, exserted; dehiscent between styles. Seeds ∞, minute ovoid; testa minutely punctate.—Glandular-downy herbs; rhizome perennial suberect; most of leaves radical petiolate orbicular, lobate or dentate;

stipules setaceous or lacerate; flowers in branching compound terminal cymes (*Carolina, Mountainous California*). See p. 329.

8? **Bolandra** A. GRAY.—"Calyx campanulate dilated produced far beyond free ovary, 5-fid; lobes 3-angular-lanceolate acuminate recurved, valvate in æstivation. Petals 6, inserted in throat, subulate-attenuate recurved persistent. Stamens 5, shorter than alternate petals; anthers cordate-2-lobed. Germen sessile, below 2-celled, above 2-fid; horns 2, soon opening inwards, stigmatose at truncate apex; ovules ∞. Fruit...?—A little herb; stems slender from granulate-bulbilliferous root; leaves alternate subreniform, 5-lobed (purple-greenish); flowers (rather large) laxly subcorymbose, long-pedicellate" (*California*). See p. 329.

9. **Sullivantia** TORR. & GRAY.—Receptacle subhemispherical; sepals 5, erect, imbricate. Petals as many, alternate, marcescent. Stamens 5, perigynously inserted with alternate petals; filaments short; anthers cordate-ovate, introrse 2-celled. Germen half-superior, 2-celled, 2-beaked, placentas 2, thick axile, ∞-ovulate. Capsule half-superior, surrounded by receptacle at base, 2-celled. Seeds ∞, scobiform ascending; testa loose reticulate winged at both ends.—A perennial herb; branches slender sparingly leafed glandular-pubescent; leaves radical long-petiolate orbicular-reniform sublobate; flowers small in 2- or 3-chotomous cymes; pedicels decurved when fruiting (*North America*). See p. 329.

10. **Oresitrophe** BUNGE.—Flowers nearly of *Saxifraga*; receptacle shortly cupulate. Sepals 5, petaloid. Stamens 10, 2-verticillate or more rarely 12–14, shortly perigynous. Germen almost wholly superior, 1-celled at base, higher up deeply 2-lobed; styles subulate; placentas 2, ∞-ovulate, capsule coriaceous, 1-celled, high, 2-beaked, 2-valved between styles. Seeds ∞, oblong smooth.—A herb (aspect of 1-leafed *Begonia*); rhizome thick scaly; leaf 1, radical serotine ovate-cordate serrate, thick petiolate; flowers in dichotomous panicled cymes, inserted at top of common scape (*Northern China*). See p. 329.

11. **Astilbe** HAMILT.—Flowers hermaphrodite or polygamous; receptacle obconical or subcampanulate. Sepals 4, 5, valvate or

imbricate and petals 4, 5, imbricate (or 0), inserted in throat. Stamens 8–10, 2-seriate, inserted with perianth; anthers introrse, sub-2-dymous. Germen inserted in concavity of receptacle, partly inferior; carpels 2, 3, inside free or more or less highly connate, terminating above in subulate styles truncate or capitellate at stigmatose apex; ovules ∞, inserted in central angle. Capsule 3-lobed, or carpels 3 folliculate, ventrally dehiscent. Seeds ∞, scobiform; testa laxly membranous, produced at both ends; albumen fleshy, sometimes copious.—Tall herbs; rhizome perennial; branches annual, simple or branching; leaves alternate, 2- or 3-nate, ternately decompound, or palmate or peltate-5-sect (*Rodgersia*); petiole dilated at base; stipules membranous adnate to petiole; flowers (small) in very branching cymiferous terminal racemes; cymes sometimes 1-parous, scorpioid; flowers sometimes (*Rodgersia*) subsessile (*Central Temperate Asia, the East, Japan, Java, North America.*) See p. 330.

12. **Lepuropetalum** DC.—Flowers hermaphrodite or polygamous minute; receptacle subcampanulate; sepals 5, ovate. Petals as many inserted in throat, included. Stamens 5, alternate and perigynously inserted with petals, included. Germen half-superior, 1-celled; placentas 2, 3, parietal, ∞-ovulate, opposite the carpels; styles as many, short, capitate at stigmatose apex. Capsule small half-superior included membranous, at apex loculicidal, 2, 3-valved; seeds ∞, oblong subrugose.—An annual (very small) glabrous herb, sprinkled with deep-brown glands; leaves alternate spathulate entire exstipulate; flowers terminal solitary pedunculate (*Chili, North America*). See p. 331.

13. **Leptarrhena** R. Br.—Receptacle subcampanulate; sepals 5, and petals as many alternate spathulate, inserted in mouth. Stamens 10, 2-seriate, perigynously inserted with petals; filaments subulate; anthers 1-celled, 2-valved. Carpels 2, scarcely cohering at base and inserted in bottom of receptacle, terminating in short styles stigmatose at simple apex; ovules ∞, inserted on subbasilar placentas, ascending. Carpels when mature erect-beaked coriaceous, dehiscent within; seeds ∞, basilar scobiform; testa membranous much produced at both ends; nucleus minute.—A herb; root slender, 1–3-headed; leaves petiolate persistent obovate serrate; petiole

sheathing at base; scape simple erect, sparingly glandular, 1, 2-bracteate, bearing small racemose-cymose flowers at base (*North-West America, Kamtchatka*). See p. 331.

14. **Tolmiea** Torr. & Gray. — Receptacle elongate-obconical subcampanulate, oblique at base, membranous, longitudinally split in front; sepals 5, unequal; larger 3 posticous imbricate. Petals 5 or 4 (anterior deficient) long capillary, inserted between sepals, finally pendulous. Stamens 3, inserted in throat of receptacle, opposite posterior sepals; filaments free; anthers basifixed, 2-celled; cells laterally longitudinally rimose, finally confluent at apex. Germen shortly stipitate elongated, 1-celled; styles 2, subulate, stigmatose at capitellate apex; placentas parietal 2, ∞-ovulate. Capsule exserted from receptacle, elongated, 2-valved between styles at apex, 2-beaked. Seeds ∞, minute, globose muricate.—A perennial herb; rhizome cylindroid; branches annual erect; leaves cauline and radical, petiolate cordate incised-lobate; stipules membranous; flowers in terminal slender racemes; pedicels nutant; bracts small; bractlets bristly (*North America*). See p. 331.

15. **Eremosyne** Endl.—Flowers hermaphrodite; receptacle concave subhemispherical. Sepals 5, oblong and petals 5, sometimes long-bristly at base, perigynous. Stamens 5, inserted and alternating with petals; filaments markedly dilated at base; anthers minute. Germen half-inferior; styles 2, divaricate, stigmatose at capitellate apex; cells 2, 1-ovuled; ovule inserted in bottom of internal corner, ascending; micropyle introrse (?) inferior. Capsule half-superior compressed transversely to septum, membranous strigose, sub-2-dymous, loculicidally 2-valved. Seeds ascending albuminous.—A low annual strigose-hairy herb; leaves alternate; "radical entire"; cauline sessile, pectinate-pinnatifid at base; flowers very small in repeatedly dichotomous cymules (*South-East Australia*). See p. 332.

16. **Vahlia** Thunb.—Flowers pentamerous; receptacle concave hemispherical or obconical. Sepals valvate. Petals as many, shorter. Stamens 5, epigynously inserted with perianth round a small annular disk; filaments free, sometimes concave much-dilated at base;

anthers introrse 2-celled. Germen inferior, 2- or more rarely 3-celled; styles 2, 3, free, stigmatose at capitellate apex; placentas subovoid, pendulous from apex of cell, ∞-ovulate. Capsule at apex 2, 3-valved. Seeds ∞, minute oblong.—Annual herbs, often pubescent or glandular; branches sub-2-chotomous; leaves opposite entire exstipulate; flowers pedunculate or sessile axillary, paired, or (the leaves changing into bracts) racemose or spicate at tops of twigs (*Tropical and Southern Africa, Tropical and Subtropical Asia*). See p. 332.

17? **Donatia** FORST.—Receptacle obconical. Sepals 5, inserted in throat, or more rarely 6–8. Petals as many, or 9, 10, linear or ovate. Stamens 3, or more rarely 2, epigynous, alternating with styles and adnate to their base; filaments soon free, subulate; anthers extrorse 2-dymous. Germen inferior, 2, 3-celled; placentas short affixed from internal corner of cell, ∞-ovulate; styles as many subulate, stigmatose at unthickened or capitellate apex. Capsule crowned by calyx, 2- or more often 3-celled, many-seeded, finally gaping at apex.—Low densely cæspitose moss-like herbs; leaves alternate densely imbricate linear thickly coriaceous entire, hairy at base; flowers (sometimes 1-sexual by abortion) terminal sessile; bractlets few below the flower, sometimes passing into sepals (*Southern Antarctic America, Tasmania, New Zealand*). See p. 332.

II. PENTHOREÆ.

18. **Penthorum** L.—Flowers 5, 6-merous; receptacle capuliform. Sepals 5, 6, valvate or slightly imbricate. Petals as many small, or 0. Stamens twice as many as sepals, perigynously inserted with them; anthers basifixed, introrsely or laterally 2-rimose. Scales 0. Carpels 5, 6, alternating with sepals, adnate within at base to receptacle, soon free, tapering into short diverging styles stigmatose at capitellate apex; placentas thick inserted in ventral angle of each ovary; ovules ∞, anatropous. Carpels 5, 6, inserted in common receptacle, dry valvately obliquely or transversely separating and dehiscing above receptacle; seeds ∞, sometimes oblong papillose, sometimes ovoid; embryo rather fleshy, straight in axis of albumen; albumen rather fleshy (frequently scanty).—Perennial erect herbs;

branches terete or angulate at apex; leaves alternate membranous, tapering at both ends, subsessile; flowers in several terminal 1-parous many flowered cymes (*North East America, China*). See p. 334.

III. CEPHALOTEÆ.

19. **Cephalotus** LABILL.—Flowers regular small; receptacle cupulate, lined by a glandular papilligerous disk. Perianth (calyx ? ?) coloured, 6-foliolate, valvate, persistent. Stamens 12, perigynously inserted with perianth; 6 larger, alternating with leaves, and 6 superposed; filaments free subulate; anthers 2-dymous introrse, longitudinally dehiscent, finally versatile; connective tumid subglandular. Carpels 6, free, inserted at bottom of receptacle round a small central process, alternating with perianth-leaves; ovaries 1-celled, shortly stipitate, tapering into uncinate styles, stigmatose at apex; ovules solitary (or more rarely 2) subbasilar, inserted in internal angle ascending, anatropous; micropyle inferior, introrse. Follicles 6, surrounded at base by persistent receptacle and perianth, shortly stipitate crinite, longitudinally gaping within. Seed suberect; testa pallid membranous; albumen fleshy; embryo axile minute.—A perennial herb; rhizome short; leaves all radical alternate petiolate exstipulate; some oblong entire not-ribbed; others changed to pendulous ascidia, with ringed operculate mouth. Flowers alternately cymose in an erect scape bare at base; cymes 1-bracteate; pedicels ebracteate (*South Eastern Australia*). See p. 335.

IV. PARNASSIEÆ.

20. **Parnassia** T.—Flowers regular hermaphrodite; receptacle shortly cupuliform. Sepals 5, imbricate, persistent. Petals 5, alternate, subsessile, entire or fimbriate, imbricate patent marcescent. Stamens 5, more or less perigynously inserted with alternate petals; anthers ovate or cordate, subintrorse 2-rimose. Scales 5, oppositipetalous, clavate at base, cuneate or multifid; laciniæ glanduliferous at apex. Germen for the most part superior, ovoid, 1-celled; placentas 3, 4, parietal (lateral cells 2); ovules ∞, anatropous; style very short thick, soon divided into 3 or 4 stigmatiferous lobes, opposite to placentas. Fruit partly or almost wholly

superior, capsular membranous, loculicidally 3, 4-valved. Seeds ∞, inserted in the middle of valves, scobiform; testa loose sacciform or subalate; albumen fleshy thin; embryo central cylindrical.—Perennial glabrous scapigerous herbs; "radical" leaves alternate petiolate, oblong ovate or reniform; scape angulate, 1-flowered, folliferous to middle, sometimes polyphyllous (*Cold regions and Temperate marshes of Northern Hemisphere, mountainous India*). See p. 337.

V. FRANCOEÆ.

21. **Francoa** Cav.—Flowers hermaphrodite regular; calyx 4-partite regular, valvate or slightly imbricate. Petals 4, alternate, equal, imbricate or contorted. Stamens 8, 2-seriate (4 longer alternipetalous), slightly perigynous with perianth; filaments free; anthers oblong, introrse 2-rimose. Glands 8, inserted with stamens and alternating, erect. Germen free oblong, 4-gonous, 4-lobed at apex; cells 4, complete or incomplete, oppositipetalous; ovules ∞, anatropous, inserted in internal angle; style short, soon dilated into 4-partite urceolate stigma. Capsule surrounded at base by persistent calyx, coriaceous elongated 4-gonous, 4-lobed, septicidally 4-valved; valves coherent, septiferous in middle, receding at apex from persistent style. Seeds ∞, small oblong curved; testa loosely membranous corrugated-striolate; albumen fleshy; embryo axile terete small. — Perennial herbs, glandular-pilose or tomentose; rhizome thick perennial; leaves alternate crowded, lyrate-pinnatifid or pinnate, glandular-dentate or sublobate, net-veined; attenuated base tapering subalate imitating petiole; stipules 0; flowers in simple or more rarely branching racemes, bare at base and erect; flowers (rarely 5-merous) bracteate; bract more or less carried up with axillary pedicel (*Chili*). See p. 339.

22. **Tetilla** DC.—Flowers irregular; calyx 4-partite; sepals unequal; posterior larger; præfloration valvate. Petals 4; anterior 2 much smaller or 0. Stamens 8, 2-seriate; posterior larger. Glands as many, alternating with stamens, erect, subclavate at apex. Germen 2–4-celled and style of *Francoa*. Capsule oblong papyraceous, 4-lobed, loculicidally 4-valved. Seeds ∞, very small oblong; testa thin striolate; embryo minute subterete, axile in fleshy albu-

men.—A perennial subacaulescent glandular-pilose herb; rhizome thin; leaves radical petiolate rotundate-cordate, sinuate-dentate, palmiveined, ribbed; petiole sheathing; flowers in loose elongated simple racemes, bare at base; pedicels thin bracteate at base (*Chili*). See p. 340.

VI. HYDRANGEÆ.

23. **Hydrangea** L.—Flowers usually 2-morphous; exterior of inflorescence often sterile subapetalous, with much enlarged calyx. Receptacle concave in fertile flowers, usually sacciform; perianth and androceum inserted on margin. Sepals 4, 5, in fertile flowers equal, small, sometimes dentiform; in sterile broadly petaloid veined unequal (exterior usually larger). Petals 4, 5, valvate. Stamens 8–10, 2-seriate; filaments slender, inserted outside base of epigynous disk; anthers short 2-celled, subintrorsely or marginally rimose. Germen inferior included in concavity of receptacle; cells 2–4, complete or incomplete; placentas as many, more or less introflexed, ∞-ovulate; style 2–4-branched nearly from base or to a variable, depth; branches stigmatose at apex or within. Capsule membranous, topped by calyx and styles; cells 2, 4, dehiscent from vertex between styles. Seeds ∞, minute, ascending or transverse; testa membranous, sometimes produced beyond nucleus; albumen thin fleshy; embryo axile cylindrical; cotyledons short.—Trees, or more often shrubs, sometimes climbing; leaves opposite petiolate, often persistent, entire, serrate or lobate, exstipulate; flowers in cymes, often 1-parous, subcorymbose; bracts of inflorescence basilar deciduous (*Eastern and Central or Southern mountainous Asia, Java, North East and South-West America*). See p. 340.

24. **Platycrater** Sieb & Zucc.—Flowers of *Hydrangea*, 4, 5-merous, or more rarely 2, 3-merous. Stamens ∞, epigynous, ∞-seriate, anthers varying in form, sometimes subcordate-truncate (*Cardiandra*), at apex stigmatose, more or less capitate. Capsule dehiscent between styles. Seeds ∞, ascending oblong; testa thin reticulate produced into a wing on both sides; embryo albuminous.—Shrubs; leaves opposite or alternate (*Cardiandra*) exstipulate, serrate or dentate, de-

ciduous; inflorescence and exterior sterile flowers of *Hydrangea* (*Japan*). See p. 342.

25. **Pileostegia** Hook. f. & Thoms.—Flowers (nearly of *Hydrangea*), 4, 5-merous; sepals short, imbricate. Petals as many, valvate, coherent-calyptrate. Stamens 8–10. Germen inferior, 4, 5-celled; style thick columnar subclavate; apex conical truncate; angles 4, 5, longitudinally stigmatose. Capsule 4, 5-celled (of *Hydrangea*).—Glabrous shrubs; leaves opposite exstipulate petiolate oblong-obovate acuminate, entire or serrate; flowers in branching compound terminal racemes (*Temperate and East Asia*). See p. 342.

26. **Dichroa** Lour.—Flowers nearly of *Pileostegia*, all fertile; petals 5, 6, valvate. Stamens 10–12, epigynous. Germen inferior, incompletely 3–6-celled; styles 3–6, diverging subclavate, stigmatiferous at apex within. Fruit baccate (deep blue), in great part inferior, indehiscent. Seeds ∞, of *Hydrangea*.—A shrub; branches rather thick; leaves alternate petiolate ovate-acuminate serrate exstipulate; flowers in compound corymbiform terminal cymes (*Southern China, Himalaya, Java, Philippine Islands*). See p. 343.

27. **Broussaisia** Gaudich.—Flowers nearly of *Dichroa*, polygamous-diœcious; germen of male flowers imperfect, for the most part superior. Petals in female flowers small or squamiform. Germen 5-celled; style thick short subconical, apex thickened to a radiate-5-lobed mass; placentas thick, simple or more often 2-partite. Berry globose many-seeded.—A small shrub; branches thick terete; leaves opposed or subverticillate; petiole exstipulate, dilated at base; flowers in terminal compound corymbiform racemes (*Sandwich Islands*). See p. 343.

VII. PHILADELPHEÆ.

28. **Deutzia** Thunb.—Flowers hermaphrodite; receptacle subcampanulate. Sepals 5, valvate; petals as many alternate, imbricate or induplicate-valvate, inserted in throat. Stamens 10, 2-seriate, inserted with perianth below edge of glandular epigynous disk; filaments flat, subulate or 3-fid at dilated apex; middle lobe antheri-

ferous; anthers subglobose-2-dymous, introrse 2-rimose. Germen inferior; cells 3, 4, complete or incomplete; styles as many elongated-filiform, surrounded at base by a disk, thickened by degrees above, stigmatose at apex or within. Ovules ∞, anatropous, ∞-seriate, obliquely imbricate, inserted on thick fleshy placentas, Capsule subglobose, corticate, tardily septicidal between styles. Seeds ∞, ascending oblong compressed; testa membranous reticulate produced at both ends beyond nucleus; embryo axile in fleshy albumen.—Pubescent or scabrous shrubs; hairs usually stellate; leaves opposite (subdeciduous) ovate or lanceolate, serrate exstipulate; flowers solitary axillary, or in simple or cymiferous axillary or terminal racemes; pedicels opposite (*Himalaya, China, Japan*). See p. 343.

29. **Philadelphus** L.—Flowers nearly of *Deutzia*, 4- or more rarely 5-merous; calyx valvate; petals imbricate or convolute. Stamens ∞, disk and germen of *Deutzia*; placentas 3–5; style partite more or less deeply or to base. Capsule (3–5-celled) and seeds of *Deutzia*.—Shrubs; leaves opposite, entire or serrate; inflorescence of *Deutzia* (*Central Europe, Himalaya, Japan, North America*). See p. 344.

30. **Decumaria** L.—Flowers nearly of *Philadelphus*, 6–10-merous; receptacle turbinate-campanulate. Germen inferior, 5–10-celled; ovules ∞, descending pluriseriate. Capsule subturbinate; apex crowned by thick capitate style; pericarp fragile thin, 2-lamellate, bursting between ribs and veins; septa membranous. Seeds ∞, albuminous (of *Deutzia* or *Philadelphus*).—A sarmentose climbing shrub; leaves opposite transparent-lineolate, petiolate, exstipulate; flowers in branching corymbiform cymes (*North America*). See p. 346.

31. **Fendlera** ENGELM & GRAY.—Receptacle shortly turbinate, 8-ribbed. Valvate sepals 4, and petals 4, alternating inserted on margin of receptacle. Stamens 8, 2-seriate, perigynously inserted with perianth; filaments flat, 2-partite at apex; lobes divaricated, produced beyond cuspidate anther. Germen half-superior; cells 4, oppositipetalous; branches of style 4, stigmatose at apex; ovules ∞, descending. Capsule partly superior conoidal, septicidally 4-valved. Seeds ∞, descending imbricate; testa reticulate-winged below;

albumen scanty; embryo axile.—An erect shrub; leaves opposite subsessile oblong entire, 3-ribbed at base, exstipulate; flowers pedunculate 1–3, terminating short twigs (*Texas, North Mexico*). See p. 346.

32. **Jamesia** TORR. & GRAY.—Receptacle very shortly turbinate; sepals 5, 3-angular-ovate, sometimes 2-fid. Petals 5, alternate, convolute. Stamens 10, 2-seriate; filaments linear complanate; anthers introrse, sub-2-dymous. Germen to a great extent superior, adnate at base inside receptacle, 1-celled; placentas 3–5, parietal, ∞-ovulate; branches of style 3–2, subexternally stigmatose at apex. Capsule surrounded by calyx at base, incompletely 3–5-celled, dehiscent at apex between styles. Seeds ∞, ovate; testa shining; embryo albuminous axile.—A branching shrub; back deciduous; leaves opposite petiolate ovate largely serrate, beneath white-pubescent, exstipulate, deciduous; flowers in terminal compound cymiferous racemes (*Rocky Mountains of North Mexico*). See p. 347.

33. **Carpenteria** TORR.—Receptacle cupuliform subhemispherical. Sepals 5–7, valvate and petals as many alternate, convolute, inserted on margin of receptacle. Stamens ∞, slightly perigynous with perianth, free; anthers shortly oblong. Germen to a great extent superior; cells 5–7; ovules ∞, ∞-seriately inserted on rather prominent 2-lobed placentas; style 5–7-fid; apex linear stigmatose. Capsule conical-ovoid, surrounded by calyx at base, 5–7-celled, loculicidal. Seeds ∞, inserted on subglobose projected placentas; testa loose reticulate; albumen fleshy; embryo axile.—A shrub; bark deciduous; branches 4-gonous; leaves opposite petiolate exstipulate, elliptical-oblong or lanceolate-entire, 3-plicostate at base; flowers few, in simple racemose cymes (*Mountainous California*). See p. 347.

34. **Whipplea** TORR.—Receptacle shortly turbinate. Sepals 5–6, and petals as many alternate imbricate (?) inserted on margin of receptacle. Stamens 10–12, perigynous; filaments subulate free; anthers 2-dymous. Germen adnate at base to receptacle, ovoid; cells 4, 5; styles as many, longitudinally stigmatose at apex within: ovule 1 in each cell, inserted below apex, descending. Capsule sub-

globose, adnate to receptacle at base, parting into 3–5 cocci, dehiscent within 1-seeded. Seeds oblong; embryo in apex of fleshy albumen, minute.—A slender undershrub, simple or sparingly branching, strigose; leaves opposite petiolate exstipulate ovate paucidentate, 3-ribbed at base, deciduous; flowers (small) in terminal racemes (*California*). See p. 347.

35. **Pterostemon** SCHAUER.—Receptacle turbinate; calyx 5-merous valvate, and petals 5, alternate imbricate, inserted on margin. Stamens 10, perigynously inserted with perianth; filaments complanate; alternipetalous, 5 broader 3-dentate at apex; tooth in middle bearing an oblong cuspidate introrse anther. Germen to a great extent inferior; cells 5, oppositipetalous; style erect, 5-fid at apex; laciniæ stigmatose at truncate apex; placentas axile, ∞-ovulate. Capsule adnate to receptacle, crowned by persistent calyx and dried staminal filaments, dehiscent by 5–10 teeth at apex; septa membranous disrupted. Seeds ∞; testa cartilaginous; embryo axile albuminous (*Philadelphus*).—A branching shrub; small twigs terete rather hairy; leaves alternate shortly petiolate obovate glandular; stipules minute; flowers in corymbiform cymes (*Mexico*). See p. 348.

VIII. ESCALLONIEÆ.

36. **Escallonia** L. FIL.—Flowers hermaphrodite, 5-merous; receptacle concave shortly tubular, turbinate or hemispherical. Calyx inserted in margin; præfloration valvate or imbricate. Petals alternate, imbricate; claw erect; lamina finally patent. Stamens 5, inserted with alternate petals below edge of epigynous disk; filaments free filiform; anthers introrse 2-rimose. Germen inferior, adnate to receptacle; cells 2, 3, complete or incomplete; ovules ∞, anatropous, clothing inflated placentas; style simple erect; apex stigmatose capitate subentire or 2, 3-lobed. Capsule crowned by calyx and style, at base septicidally 2, 3-valved; placentas filiform, usually adhering to axis. Seeds ∞, minute linear-oblong; testa membranous, often loose, sometimes fimbriate at base; albumen fleshy; embryo axile.—Trees or shrubs, often glandular-pubescent; leaves alternate, entire or serrate (evergreen) exstipulate; flowers in

simple or branching racemes, usually terminal, rarely axillary (*Southern America, especially the West*). See p. 348.

37. **Valdivia** Rémy.—Flowers nearly of *Escallonia,* 5–7-merous; germen perfectly or imperfectly 2, 3-celled. Petals at base bearded inside, valvate. Capsule membranous, indehiscent (?); placentas globose foveolate, ∞-seeded. Seeds minute; testa sulcate; embryo in base of small oily albumen.—A little low subherbaceous shrub; leaves alternate or subopposite obovate-lanceolate acute sharply glandular-eroded or dentate, exstipulate; flowers in short axillary racemes (*Chili*). See p. 350.

38. **Quintinia** A. DC.—Flowers nearly of *Escallonia;* receptacle obconical. Sepals 5, ovate or 3-angular, minute, persistent, and petals 5, alternate, imbricate, deciduous, inserted in throat of receptacle. Stamens 5, inserted with alternate petals; anthers ovate introrse. Germen to a great extent inferior; cells 3–5, complete or incomplete; style stigmatose capitate at apex, 3–5-lobed; ovules ∞, 2-seriate. Capsule inferior or half-inferior, 3–5-ribbed; often 1-celled owing to placentas being more or less retracted, dehiscent at conical vertex between lobes of style. Seeds ∞, elongated fusiform; testa membranous loose expanded to thin wing; embryo in fleshy minute albumen.—Small trees or shrubs; leaves persistent alternate petiolate, oblong or lanceolate, entire or serrate, glabrous; stipules 0; flowers in simple or branching axillary and terminal racemes (*Australia, New Zealand*). See p. 350.

39. **Forgesia** Commers.—Receptacle turbinate. Sepals 5, free, valvate. Petals 5, connate at very base to a gamopetalous corolla, 3-angular, valvate. Stamens 5, alternipetalous, inserted round thick annular disk; filaments free; anthers 2-celled, introrse 2-rimose. Germen to a great extent inferior; styles 2, free, thickened at base, stigmatose within at thickened sub-2-lobate apex; cells 2, complete or incomplete; placentas thick 2-lobed in each cell, ovuliferous on both lobes. Capsule partly superior, 2-celled, 2-beaked by styles, dehiscent between styles; epicarp finally seceding from mesocarp. Seeds ∞, small...—A small glabrous shrub (turning black when dried); leaves alternate petiolate

lanceolate glandular-serrate exstipulate; flowers in lax cymiferous terminal racemes (*Bourbon*). See p. 351.

40. **Argophyllum** FORST.—Flowers hermaphrodite; receptacle scarcely or more or less cupuliform. Sepals 5, 6, inserted on margin, 3-angular, valvate. Petals as many, alternate, valvate, with a thick petaloid internal scale, silky-fimbriate above. Stamens 5, 6, inserted and alternating with petals; filaments free; anthers introrse 2-rimose. Germen almost wholly, or partly superior; cells 2–4, or 5, 6, oppositipetalous; ovules ∞, anatropous, inserted on a more or less unequal-tumid placenta affixed by short stipe to internal angle. Capsule surrounded by receptacle and calyx, loculicidally 2–6-valved; valves sometimes bipartite. Seeds ∞, minute; testa rugose cancellate; albumen fleshy; embryo minute axile.—Silky-pubescent shrubs; leaves alternate petiolate coriaceous, whitish or rusty below, entire or coarsely dentate; stipules 0; flowers in axillary and terminal corymbiform cymes (*New Caledonia, Australia*). See p. 351.

41? **Carpodetus** FORST.—Flowers nearly of *Argophyllum*; receptacle turbinate. Sepals 5, 6, narrow, deciduous. Petals as many, valvate. Stamens as many, perigynously inserted with perianth; anthers introrse. Germen of *Argophyllum*, inferior, 3–6-locular, crowned with 5-lobed glandular disk; lobes obtuse oppositipetalous. Fruit coriaceous-fleshy, surrounded halfway up by cicatrix of perianth, indehiscent; cells 3–6, many-seeded. Seeds small, descending, long-funiculate; testa foveolate; embryo minute albuminous.—A branching small tree; leaves alternate (evergreen) ovate-lanceolate, glandular-serrate petiolate; stipules scarcely conspicuous; flowers in compound axillary, terminal or leaf-opposed cymes (*New Zealand*). See p. 352.

42. **Berenice** TUL.—Flowers nearly of *Argophyllum* or *Carpodetus*, 5-merous; receptacle concave hemispherical eglandulose. Perianth valvate and stamens 5, epigynous. Germen inferior, 3, 4-celled; ovules ∞; placentas of *Carpodetus*; style cylindrical erect; apex very thick globose stigmatose. Capsule crowned by calyx, loculicidally 3-valved at flat or depressed apex. Seeds ∞; testa rugose;

embryo axile albuminous.—An undershrub; branches slender; leaves alternate, ovate or oblong, acuminate, narrowly serrulate; flowers in lax branching terminal racemes; pedicels pluribracteate (*Bourbon*). See p. 352.

43. **Polyosma** Bl.—Receptacle oblong-ovoid or turbinate; throat much contracted. Calyx superior short, 4-dentate, persistent. Petals 4, alternate and epigynously inserted with sepals, linear, valvate, deciduous. Stamens 4, inserted and alternating with petals; filaments free; anthers elongated basifixed, introrse, longitudinally 2-rimose. Germen inferior, 1-celled; style slender; base dilated after anthesis; apex more or less thickened stigmatose; placentas 2, parietal intruded; ovules ∞, anatropous. Berry ovoid; apex masked by cicatrix of perianth; 1-celled. Seed 1, ascending filling cell; testa rather thick; embryo minute below apex of thick fleshy albumen.—Branching trees or shrubs; leaves alternate or opposite, petiolate simple exstipulate persistent; flowers rarely solitary, in multifloral terminal racemes; bractlets 1, 2 below receptacle (*South-east Asia, warm Oceania*). See p. 353.

44. **Itea** L.—Flowers nearly of *Polyosma;* receptacle obconical or subcampanulate. Sepals 5, ovate or subulate, imbricate, persistent, and petals as many alternate valvate, inflexed at very apex; afterwards patent or reflexed, inserted in margin of receptacle. Stamens 5, inserted with alternate petals below edge of perigynous disk; filaments free subulate; anthers introrse 2-rimose. Germen half- or almost wholly superior; cells 2, complete or incomplete; style erect simple, finally 2-partible; apex stigmatose capitate; ovules ∞, sometimes few, 2-seriate on parietal placentas. Capsule to a great extent superior, conical or oblong, septicidally 2-valved. Seeds ∞, or few fusiform; testa laxly membranous produced on both sides, sometimes crustaceous shining; albumen fleshy; embryo axile cylindrical.—Trees or shrubs; leaves alternate petiolate exstipulate, oblong or lanceolate, glandular-dentate or crenate; flowers in simple racemes sometimes much elongated, axillary and terminal (*North America, Mountainous Central and Eastern Asia, Java*). See p. 353.

45. **Phyllonoma** W.—Receptacle obconical. Sepals and petals 5, alternate, valvate, inserted in throat. Stamens 5, inserted with alternate petals under edge of epigynous disk; filaments free; anthers 2-dymous, introrse. Germen adnate to receptacle, 1-celled; style very short; stigmatose lobes 2, recurved; placentas 2, parietal, ∞-ovulate. Berry small, crowned by cicatrix of perianth. Seeds ∞, more often few; testa coriaceous rugose; embryo minute globose-pyriform in base of fleshy albumen.—Glabrous trees or shrubs; leaves alternate petiolate exstipulate ovate-lanceolate acuminate, entire or serrate; flowers (minute) inserted in upper surface of leaves below apex of midrib, shortly racemose-cymose (*Mexico, New Granada*). See p. 354.

46. **Choristylis** HARV.—Flowers (nearly of *Phyllonoma*) polygamous; receptacle shortly obconical; sepals 5, and petals as many, alternate deltoid perigynous valvate. Stamens 5 alternipetalous; filaments perigynous free short; anthers introrse 2-rimose. Germen half-inferior; cells 2, complete or incomplete, ∞-ovulate; styles 2, stigmatose at capitellate apex, at first erect-coalite, afterwards freed recurved. Capsule half-superior, conical at apex, septicidally dehiscent by styles. Seeds ∞; embryo...?—A shrub (habit cf *Celastrum* or *Rhamnus*); leaves alternate ovate-oblong acute glandular-serrate petiolate exstipulate; flowers small in small branching supra-axillary racemes (*Southern Africa*). See p. 355.

47? **Stichoneuron** HOOK F. & THOMS.—Flowers hermaphrodite or polygamous, minute; receptacle concave obconical (in males very short); perianth-leaves 4, or more rarely 5, inserted in margin of receptacle; præfloration imbricate. Stamens 4, 5, subepigynously inserted with perianth-leaves and opposite to them; filaments free, dilated at base, finally elongated; anthers short sub-2-dymous, oblique within at top of filament, introrse 2-rimose. Germen (in male flower 0) included in concavity of receptacle, inferior, 1-celled; style very short; lobes 2, obtuse stigmatose; placentas 2, parietal, alternating with lobes of style, ∞-ovulate. Fruit...?—A small shrub (?); branching nodose at leaves (articulate?); leaves alternate shortly petiolate oblong-lanceolate acuminate entire membranous glabrous, penniveined, 3–5-plicostate at base, transversely veined;

flowers in axillary filiform racemes, bare at base, densely bracteate at apex; bracts 1-flowered; pedicels articulated above middle (*East Indies*). See p. 355.

IX. BREXIEÆ.

48. **Brexia** Dup.-Th.—Flowers hermaphrodite; receptacle slightly convex. Sepals 5, imbricate, deciduous. Petals 5, alternate; præfloration twisted or imbricate. Stamens 5, alternipetalous, hypogynously inserted with perianth; filaments subulate alternating with subulate-conical unequal lobes of thick disk (larger lobes 2, lateral to filament); anthers oblong-sagittate, introrse 2-rimose. Germen free, surrounded at base by sessile disk, ovate-5-gonous; cells 5, oppositipetalous, complete or incomplete; ovules ∞, 2-seriate on (sometimes pulpy) placentas. Fruit drupaceous; mesocarp thin or woody, afterwards 1-celled. Seeds ∞, ovate-oblong, unequally compressed or angulate; testa black coriaceous; cotyledons of thick embryo amygdaloid; radicle short; albumen fleshy thin.—Glabrous small trees or shrubs; twigs thick; leaves alternate (evergreen) coriaceous, entire or spiny-dentate; stipules very small, scarcely conspicuous; flowers cymose, inserted in top of axillary, usually rather compressed, sometimes subcladodiform peduncle (*Madagascar*). See p. 355.

49. **Anopterus** Labill.—Flowers nearly of *Brexia;* receptacle very shortly cupuliform. Sepals 5–9, and petals as many alternate, imbricate, shortly perigynous on margin of receptacle. Stamens 5–9, alternipetalous; filaments subulate, dilated at base; anthers cordate-oblong versatile, introrse 2-rimose. Germen for the most part superior, 1-locular, tapering to short style at apex; style finally 2-partible; apex 2-lobed, stigmatose within; placentas 2, parietal, ∞-ovulate. Capsule oblong coriaceous surrounded at base by persistent calyx, septicidally 2-valved. Seeds ∞, inserted in edges of valves; testa membranous dilated-winged towards hilum; nucleus small apical; albumen fleshy; embryo minute axile.—Small trees or shrubs, quite glabrous; leaves alternate persistent petiolate exstipulate elongated acuminate, glandular-dentate or serrate, coria-

ceous; flowers in terminal racemes; bracts leafy deciduous (*Mountainous Australia, Tasmania*). See p. 357.

50. **Ixerba** A. Cunn.—Flowers hermaphrodite; receptacle subconvex. Sepals 5, connate at very base, imbricate, patent, deciduous. Petals as many alternate free, imbricate. Stamens 5, alternipetalous; filaments free; anthers introrse, 2-celled, longitudinally rimose, versatile. Germen free, surrounded at base by a 5-lobed disk between stamens, 5-ribbed; style subulate, 5-furrowed, twisted, stigmatose at tapering apex; cells of ovary 5, oppositipetalous, 2-ovulate. Ovule collaterally descending subanatropous; micropyle introrse superior. Capsule thickly coriaceous, 5-celled, loculicidally dehiscent to valves through 5-partible style; cells 1, 2-seeded. Seeds descending half-anatropous; hilum linear-elongated arillate; embryo and albumen fleshy; cotyledons elliptical oblong amygdaloid; radicle short superior.—A glabrous tree; leaves alternate opposite and subverticillate, linear-elongated, glandular-serrate petiolate exstipulate, evergreen; flowers in short axillary cymes (*New Zealand*). See p. 358.

51. **Roussea** Sm.—Receptacle shortly and broadly obconical. Sepals 4, 5, equal or unequal, valvate, persistent, afterwards reflexed. Petals as many inserted with alternate sepals in edge of receptacle, united into a campanulate corolla, villous outside, valvate, afterwards reflexed or revolute at apex. Stamens 4, 5, inserted between 4, 5 arcuate lobes of disk confluent with base of germen; filaments thick erect; anthers oblong-sagittate extrorse. Germen almost wholly superior, 4–7-gonous-pyramidate; style thick erect; apex subglobose, 4–7-lobed stigmatose; cells 4–7 oppositipetalous, ovules ∞, ∞-seriate on thick placentas. Berry ovate-pyramidate subexsuccous, 4–7-gonous; septa rather fleshy. Seeds ∞, nestling in pulp; albumen fleshy, embryo small axile.—A glabrous climbing shrub; small branches terete thick; leaves opposite and verticillate, petiolate, ovate or oblong, glandular-serrate coriaceous, exstipulate; flowers axillary solitary or few, bursting from bracteate buds, nutant (*Mascarene Is.*). See p. 358.

52. **Abrophyllum** Hook. f.—Flowers 5–6-merous; receptacle

hardly cupulate. Sepals short, deciduous. Petals alternate, valvate deciduous. Stamens alternipetalous hypogynous under edge of scarcely conspicuous disk; anthers oblong, introrse 2-rimose. Germen oblong-conical; cells complete; placentas axile, ∞-ovulate; style short thick, 5, 6-lobed. Berry small oblong; cells 5, 6, many seeded. Seeds subglobose; testa crustaceous cancellate; albumen fleshy oily; embryo axile short.—A shrub; leaves alternate broad petiolate exstipulate lanceolate acuminate subserrate membranous; flowers in usually 2-chotomous, pedunculate, axillary or terminal cymes (*South-east Australia*). See p. 359.

53. **Cuttsia** F. MUELL.—Flowers nearly of *Abrophyllum*, 5-7-merous; receptacle shortly cupulate. Sepals valvate, petals and stamens equal in number; anthers subovate. Germen for the most part superior; cells 5–7, ∞-ovulate; style erect cylindrical; apex 5–7-lobed stigmatose. Capsule almost wholly superior, loculicidally 5–7-valved.—A shrub; habit leaves and inflorescence of *Abrophyllum* (*East Australia*). See p. 359.

X. PITTOSPOREÆ.

54. **Pittosporum** BANKS.—Flowers regular; receptacle convex or slightly concave. Sepals 5, free or connate at base; præfloration imbricate. Petals as many, alternate, sometimes very much narrowed at base, free or connivent, more or less highly coherent or connate; præfloration imbricate or twisted. Stamens 5; filaments subulate, free or coherent with alternate petals; anthers erect ovate-oblong, longitudinally 2-rimose introrse. Germen sessile or shortly stipitate, imperfectly or perfectly 2-celled (more rarely 3–5-celled); style erect; apex stigmatose, capitate or more or less lobate. Ovules ∞ on each placenta, 2-seriate, anatropous, often ascending. Capsule ovoid obovoid or subglobose, often rather compressed; valves 2 (more rarely 3–5), coriaceous or subligneous, bearing placentiferous half-septa in middle. Seeds ∞, often nestling in viscid fluid, rarely marginate-alate (*Hymenosporum*); albumen fleshy or horny; embryo minute contained in a small cavity of albumen near the hilum.—Small trees or shrubs; leaves alternate or subverticillate at apices of

twigs, evergreen, simple, entire or sinuate-dentate, exstipulate; flowers terminal, or lateral, solitary or more often in simple or branching, sometimes corymbose racemes (*Asia, Tropical Africa, Pacific Islands, Australia, New Zealand*). See p. 360.

55. **Marianthus** HUEG.—Flowers 5-merous; petals free, erect-connivent at base or more rarely to middle or beyond into a sometimes oblique corolla, patent above. Stamens 5; filaments filiform or dilated (*Calopetalon*); anthers erect, usually oblong 2-rimose. Germen sessile or shortly stipitate; placentas 2, 3, ∞-ovulate, sometimes contiguous inside; style filiform. Capsule ovoidal or oblong, compressed or subinflated, membranous or thinly coriaceous, loculicidal or sometimes septicidal; seeds subglobose, obovoid or subreniform, short or muricate corrugated (*Rhytidosporum*); funicle sometimes thickened.—Undershrubs; branches flexuous procumbent or voluble; leaves entire or serrate; inferior rarely lobate or dissected; flowers more rarely solitary in compound cymiferous racemes, sometimes corymbiform or umbelliform, and terminal (*Australia*). See p. 362.

56. **Bursaria** CAV.—Flowers 4- or more often 5-merous; sepals very small. Petals narrow spreading almost from base. Stamens 4, 5; filaments subulate; anthers erect, ovoid or oblong, 2-rimose. Germen placed on thick short, 5-furrowed stipe; placentas 2, parietal, very prominent; ovules ∞; funicles rather long descending; style short. Capsule shortly stipitate thin-coriaceous plano-compressed, broadly orbiculate-sub-2-lobate, loculicidal at edges; valves 2, hardly freed in middle, impressed outside against dissepiment; seeds few reniform compressed.—Rigid shrubs; abortive twigs usually spinescent; leaves small entire, often fascicled; flowers in terminal branching compound cymiferous pyramidate racemes (*Extra-tropical Australia*). See p. 362.

57. **Sollya** LINDL.—Flowers 5-merous; sepals small. Petals obovate, spreading from base. Stamens 5; filaments a little shorter than anther; anthers erect connivent into a cone round gynæceum, introrse 2-rimose. Germen sessile; placentas 2, ∞-ovulate, finally contiguous inside; style short. Berry oblong, indehiscent;

seeds globose or subovoid, nestling in viscid pulp.—Undershrubs; branches flexuous or voluble; leaves narrow, entire or sinuate; flowers solitary to apices of small branches, pedunculate or more often laxly racemose-cymose, nutant (*South-west Australia*). See p. 363.

58. **Cheiranthera** A. Cunn.—Flowers nearly of *Sollya;* petals obovate oblong, spreading from base. Stamens 5; filaments free; anthers longer than filament, more or less declinate secund, 2-porous at apex. Germen of *Sollya;* style subulate. Fruit nearly dry ovoid, indehiscent; seeds ∞, subglobose.—Shrubs or undershrubs; branches flexuous or voluble; leaves narrow entire; flowers terminal solitary pedunculate, or peduncles laxly many-flowered, suberect or nutant (*Extra-tropical Australia*). See p. 363.

59. **Billardiera** Sm.—Flowers 5-merous; sepals distinct, valvate or imbricate. Petals connivent or coherent beyond middle to a tube, spreading above. Stamens 5; filaments filiform, longer than anthers; anthers erect, ovoid or oblong, introrse 2-rimose. Germen sessile; placentas 2, finally contiguous, ∞-ovulate; style short or elongate. Berry ovoidal or oblong, indehiscent; seeds globose, ovoidal or reniform, nestling in viscid or subliquid pulp.—Undershrubs; branches voluble; leaves entire or sinuate; flowers erect at apices of twigs solitary pedunculate or more often in racemiform, sometimes corymbose cymes (*Extra-tropical Australia*). See p. 363.

60? **Pronaya** Hueg.—Flowers nearly of *Billardiera;* staminal filaments filiform or complanate at base; anthers oblong, at first erect, soon revolute above, introrse 2-rimose. Germen nearly of *Billardiera;* placentas 2, parietal, ∞-ovulate; style short. Fruit and seeds of *Billardiera*.—Undershrubs; branches flexuous or voluble; leaves narrow entire; flowers in spurious, sometimes corymbiform, compact terminal racemes (*South-west Australia*). Se e p. 364.

61. **Citriobatus** A. Cunn.—Flowers 4-merous; sepals distinct very small. Petals connivent or coherent to a tube beyond middle, spreading at apex. Stamens 5; filaments subulate; anthers erect

oblong, introrse 2-rimose. Germen subsessile; placentas 2, parietal pluriovulate; style short. Fruit globose, coriaceous or indurated, indehiscent; seeds few or 1, subglobose nestling in viscid pulp.—Rigid shrubs, usually armed with short spinescent twigs; leaves small, entire or dentate; flowers solitary sessile, small, surrounded by 2, 3, sepaloid bractlets (*East Australia*). See p. 364.

XI. RIBESIEÆ.

62. **Ribes** L.—Flowers hermaphrodite or 1-sexual by abortion; receptacle hollow ovoid or subspherical, sometimes sacciform. Calyx tubular or campanulate, inserted in mouth of receptacle above, often coloured disks; lobes 4, 5, alternate, usually small squamiform, included; præfloration shortly imbricate, or 0. Stamens 4, 5, inserted with alternate petals in throat of receptacle; filaments short or elongated, sometimes exserted; anthers subglobose or 2-dymous, introrse, 2-rimose. Germen inferior, adnate to receptacle, 1-celled; style 2-fid or 2-partite to a variable depth at base; branches simple stigmatose at apex; ovules ∞, anatropous, 2–∞-seriate on 2 parietal placentas (or very rarely 3, 4), alternating with styles. Berry globose or oblong, crowned at apex by dried calyx, pulpy within. Seeds ∞, immersed in pulp; exterior integument cellulose-gelatinous; interior crustaceous; albumen fleshy; embryo minute subterete.—Shrubs; often glandular-resinous, unarmed or armed with scattered thorns sometimes pulvinar 2-nate; leaves alternate, often fascicled petiolate, entire or more often crenate incised or lobate; vernation plicate or convolute; petiole often dilated at base to lateral adnate stipules (?); flowers racemose or rarely subsolitary; pedicels 1-bracteate at base, 2-bracteolate at middle (*Europe, Temperate Africa and Asia, Temperate America and Andine South America*). See p. 364.

XII. BAUEREÆ.

63. **Bauera** Banks. — Flowers hermaphrodite, 4–10-merous; receptacle sometimes rather concave; sepals often dentate, imbricate or subvalvate, persistent. Petals as many alternate subsessile imbricate. Stamens inserted with petals round thin disk, as many alter-

nate, or ∞; filaments free slender; anthers sub-2-dymous, introrsely or laterally rimose. Germen altogether or almost wholly superior, hairy, completely or incompletely 2-celled; styles 2, usually rather remote at base, slender recurved, stigmatose at unthickened apex; ovules ∞, anatropous, ∞-seriate, transverse or ascending. Capsule sub-2-dymous compressed, sometimes truncate at apex, loculicidally 2-valved from apex; valves sometimes bipartite; seeds ∞; testa coriaceous granulate; embryo axile nearly terete; albumen fleshy.—Branching shrubs, glabrous or glandular-hairy; leaves opposite, 3-foliolate (spuriously verticillate); leaflets sessile serrate; stipules 0; flowers solitary axillary pedunculate, subsessile by lateral leaves, or subsessile (thence subcapitate) by superior leaves (*Eastern Temperate and Southern Australia*). See p. 368.

XIII. CUNONIEÆ.

64. **Cunonia** L. — Flowers hermaphrodite; receptacle rather convex. Calyx 5-merous; leaflets deciduous, connate at base; præfloration slightly imbricate. Petals as many, imbricate inserted with alternate sepals under edge of glandular hypogynous (10-furrowed) disk. Stamens 10, 2-seriate, hypogynous with petals; filaments free exserted; anthers small, 2-dymous, introrse 2-rimose. Germen superior; cells 2, complete or incomplete; styles bipartite branches subulate-elongated, persistent, simple at stigmatose apex; ovules ∞, 2-seriately descending in each cell. Capsule coriaceous ovoid-subcompressed, 2-beaked, septicidally 2-valved; valves boat-shaped, gaping above within; exocarp usually seceding from endocarp. Seeds ∞, oblong angulate compressed; testa membranous slightly winged; albumen fleshy; cotyledons of axile embryo oblong.—Trees or shrubs; leaves opposite petiolate, 3-foliolate or imparipinnate; leaflets 2, 3-jugal, glandular-serrate; stipules large oblong coriaceous, valvate, soon caducous; flowers racemose; racemes axillary dense, opposite, straight, cymiferous on opposite sides (*South Africa, New Caledonia*). See p. 369.

65? **Weinmannia** L.—Flowers nearly of *Cunonia*, hermaphrodite or polygamous, 4, 5-merous; receptacle sometimes shortly concave. Calyx persistent or deciduous. Stamens 8–10, inserted in base of

free disk. Capsule nearly of *Cunonia*, septicidally 2-valved; valves cymbiform, gaping above within. Seeds ∞, sometimes few, oblong, reniform or subglobose; testa membranous, usually rough with scattered hairs, sometimes subalate; albumen, embryo and other parts of *Cunonia*.—Trees and shrubs, glabrous or tomentose; leaves opposite, simple, 3-foliolate or imparipinnate; leaflets coriaceous, often glandular serrate; rachis sometimes winged; stipules varying, sometimes broad, deciduous; racemes axillary or terminal (*Tropical Continental and insular Asia and Africa, Oceania, New Zealand, Tropical, Subtropical and Temperate South America*). See p. 370.

66. **Spiræanthemum** A. Gray.—Flowers nearly of *Weinmannia*, apetalous, 4, 5-merous. Sepals valvate. Stamens twice as many or as many (4, 5 alternisepalous, abortive). Glands 4–10, alternate with stamens. Carpels equal in number to and alternate with sepals, or 2, 3 (in male flowers rudimentary or sterile), free; germen 1-celled; style stigmatose at dilated apex; ovules 1–5, or ∞, 2-seriate in ventral angle. Follicles 1–5, dehiscent inwards. Seeds 1-∞, compressed; testa winged above or on both sides; embryo albuminous.—Shrubs or small trees; leaves opposite or verticillate, petiolate simple; stipules deciduous; flowers in axillary branching racemes; pedicels articulate (*New Caledonia, Islands of Samoa, Viti, and neighbourhood*). See p. 372.

67. **Tetracarpæa** Hook. f.—Flowers 4-merous; receptacle rather convex. Sepals free, imbricate. Petals alternate hypogynous unguiculate, imbricate. Stamens 8, 2-seriate hypogynous; filaments free; anthers elliptical-oblong marginally rimose. Carpels 4, oppositipetalous stipitate erect linear-oblong, 1-celled, terminating in persistent short styles, stigmatose at obtuse apex; ovules ∞, inserted in internal angle of germen. Follicles 4, coriaceous stipitate, longitudinally dehiscent inwards. Seeds ∞, minute elongated; testa loose membranous slightly produced on both sides; nucleus minute; embryo subglobose, nestling in base of fleshy albumen.—A rigid glabrous low small shrub; leaves alternate and opposite, exstipulate, shortly petiolate, thickly coriaceous shining obovate-oblong irregularly duplicate-serrate; teeth subglandular; flowers in

erect racemes; bracts glandular-serrate (*Mountainous Tasmania*). See p. 373.

68. **Geissois** Labill.—Flowers apetalous, 4, 5-merous; sepals hirsute within, valvate, deciduous. Stamens 8–10, 2-seriate, or 15–25; filaments elongated free, inserted in base of thin hypogynous disk; anthers 2-dymous. Germen free, 1-celled; placentas 2, parietal; ∞-ovulate; branches of style 2, simple at stigmatose apex. Capsule coriaceous, elongated or subclavate, septicidally 2-valved. Seeds ∞, ascending imbricate oblong; testa membranous, winged above; cotyledons of albuminous embryo subfoliaceous.—Trees; leaves opposite petiolate, digitately 3–5-foliolate; leaflets coriaceous, entire or serrate; stipules large membranous; flowers in simple lateral racemes (*Australia, New Caledonia, Fiji Is. and neighbourhood*). See p. 374.

69. **Lamanonia** Velloz.—Flowers nearly of *Geissois*; sepals 5, 6, valvate, inserted in short receptacle. Stamens ∞, free, inserted under edge of thin disk; 5, 6, oppositisepalous, larger; interposed ∞, lesser; anthers introrse, 2-celled, finally versatile, 2-rimose. Germen free; styles 2, free divergent, stigmatose at minutely capitate apex; placentas 2, parietal, ∞-ovulate. Capsule oblong woody, septicidally 2-valved; valves 2-fid. Seeds ∞, imbricate, complanate, gibbous at base; external integument produced upwards to a membranous wing; albumen fleshy; embryo axile.—Trees; leaves opposite, digitate, 3–5-foliolate; stipules large membranous; flowers in axillary racemes (*South Brazil*). See p. 374.

70? **Gumillea** R. & Pav.—"Calyx campanulate, semi-5-fid; laciniæ erect-patent. Stamens 5, inserted in bottom of calyx; anthers subglobose. Germen free, 2-celled; styles 2, short subulate diverging. Capsule 2-beaked; seeds ∞, minute subrotund.—An erect branching shrub; branches terete patulous tender-hirsute; leaves alternate imparipinnate; leaflets entire glabrous; stipules large leafy subreniform reflexed; flowers in terminal elongated hirsute pendulous subspicate racemes" (*Peruvia*). See p. 374.

71. **Ceratopetalum** Sm.—Flowers hermaphrodite; receptacle con-

cave obconical. Sepals 4, 5, inserted in margin, 3-angular, valvate. Petals as many alternate, linear laciniate, or 0. Stamens 8–10, 2-seriate; filaments inserted with perianth around epigynous disk, inflexed, finally erect; anthers introrse 2-rimose. Germen to a great extent inferior, adnate to receptacle, 2-celled; styles 2, subulate recurved, stigmatose at apex. Ovules few (usually 4) 2-seriate in internal angle of cells, descending. Fruit dry crowned by accrete calyx; mesocarp thin suberous; endocarp very hard. Seed 1, descending; albumen fleshy; embryo curved. — Shrubs; leaves opposite glabrous petiolate, simple or 3-foliolate; stipules interpetiolar, caducous; flowers in branching terminal and axillary pedunculate cymes (*Australia*). See p. 375.

72. **Aphanopetalum** Endl.—Receptacle very short cupuliform; sepals 4, decussate, membranous or subcoriaceous veined, enlarged after anthesis, imbricate, persistent. Petals 4, alternate very small linear or lanceolate, or 0. Stamens 8, slightly perigynous; filaments free; anthers oblong introrse, 2-celled, 2-rimose. Germen nearly free, 4-furrowed; cells 4, alternating with sepals; style erect, 4-furrowed; apex divided into 4 reflexed lobes, stigmatiferous within. Ovules solitary in each cell, descending from rather thick funicle inserted at top of internal angle; micropyle introrse superior. Fruit nucamentaceous, involucrate by accrete calyx, 1-celled. Seed 1, reniform; integuments thick; albumen fleshy; embryo curved glabrous.—Voluble shrubs; leaves opposite simple; stipules small or 0; flowers axillary or cymose pedunculate; pedicels 2-bracteolate half way up (*Eastern Temperate Australia*). See p. 375.

73. **Anodopetalum** A. Cunn. — Flowers nearly of *Platylopus*, 4, 5-merous; stamens 8–10, or more rarely (owing to some alternipetalous being geminate) 12–15; filaments inserted under disk or edge of disk; connective of anthers produced at apex, subulate. Germen superior; styles 2, diverging; cells 2, 2- or pauciovulate; ovules descending subanatropous. Fruit fleshy oblong, indehiscent (?), 1-seeded. Seed descending... ?—A glabrous tree; leaves opposite petiolate simple serrate; stipules interpetiolar lanceolate; flowers axillary solitary or few cymose, 2-bracteolate (*Tasmania*). See p. 376.

74. **Caldcluvia** Don.—Flowers nearly of *Weinmannia ;* receptacle shortly cupulate. Sepals 4, 5, valvate. Petals as many shorter, linear-lanceolate. Stamens 8, 10, inserted with petals ; perigynous glands as many, interposed; filaments free; anthers introrse 2-rimose. Germen free, styles and ovules of *Weinmannia*. Capsule coriaceous, 2-beaked, septicidally 2-valved; valves boat-shaped gaping above ; placentas filiform, finally free. Seeds ∞, elongated; testa membranous lax; embryo nearly terete in axis of fleshy albumen.—Small trees; leaves opposite simple petiolate glandular-serrate; stipules large foliaceous subfalcate persistent; flowers in dense branching pedunculate cymiferous racemes (*South Chili*). See p. 376.

75. **Schizomeria** Don.—Receptacle shortly cupuliform; margin with 4, 5, nearly free, 2-lobed oppositipetalous glands. Sepals 4, 5, 3-angular, valvate. Petals as many shorter unequal-dentate. Stamens 10, inserted outside disk; filaments free; anthers ovoid; connective produced beyond cells to a short cone. Germen free, 2, 3-celled; styles 2, 3, short recurved; ovules 2–4, descending in each cell; micropyle extrorse superior. Fruit drupaceous, with receptacle and calyx persisting at base; putamen bony. Seed 1, curved; embryo curved (green); albumen fleshy.—A tree; leaves opposite simple petiolate; stipules small; flowers in terminal, usually 3-chotomously cymose racemes (*Southern New France*). See p. 376.

76. **Platylophus** Don.—Receptacle shortly cupuliform, with shortly urceolate disk within. Sepals 4, 5, 3-angular, valvate, slightly perigynous. Petals as many alternate, shorter, entire or 2, 3-dentate. Stamens 8–10, inserted with petals around disk; alternipetalous 4, 5, longer; filaments free; anthers sub-2-dymous, beaked by connective produced beyond cells. Germen free, 2-celled; styles 2, subulate recurved; ovules 2, collaterally descending in each cell; micropyle extrorse superior. Capsule turgid subovoid coriaceous, compressed-winged at apex, surrounded at base by calyx, finally septicidally 2-valved; valves 1-seeded, finally seceding from filiform placentas. Seeds oblong-curved; embryo in fleshy axile albumen.—A glabrous tree; leaves opposite, 3-foliolate; stipules small de-

ciduous; flowers in axillary long-pedunculate cymiferous racemes (*Southern Africa*). See p. 376.

77. **Gilbeea** F. MUELL. — Flowers hermaphrodite; receptacle slightly concave, disciferous within. Sepals 5, inserted in edge, valvate. Petals 5, alternate shorter, apex truncate or incised, angulate and bearing a small cupuliform gland on either side. Stamens 10, 2-seriate, slightly perigynous with perianth; filaments free; anthers subglobose introrse rimose. Germen 3-gonous; styles 3, recurved, stigmatose at slightly thickened apex; cells 3; ovules 2–6, inserted in ventral angle, descending. Capsule surrounded at base by small receptacle; cells 3, winged at back; fertile 1–3, 1-seeded. Seed descending; albumen fleshy; cotyledons of axile embryo longer than superior radicle.—A hirsute tree; leaves opposite pinnate, sometimes 1-foliolate; leaflets opposite; flowers in large terminal much branching cymiferous racemes; bracts and bractlets concave, opposite or alternate (*Tropical Eastern Australia*). See p. 377.

78. **Acrophyllum** BENTH.—Flowers hermaphrodite, 4–6-merous; receptacle small convex. Calyx gamophyllous at base; lobes oblong-acute, valvate, persistent. Petals as many elongated, imbricate. Stamens 8–12, inserted with perianth at base of disk; filaments long-exserted, inflexed in the bud; anthers small, 2-dymous. Germen superior, sub-2-locular; styles 2, straight elongated subulate, persistent, stigmatose at simple apex; ovules ∞, 2-seriate in each cell (more or less complete). Capsule coriaceous subturgid, septicidally 2-partible; valves terminated by style, ∞-seeded at edge. Seeds papillose outside; albumen... ?—An erect branching shrub; leaves *opposite or verticillate, sessile oblong, coarsely dentate, veined*; stipules rigid, tardily deciduous; flowers numerous, spuriously verticillate in sessile axillary cymes; pedicels bracteolate at base, defract when fruiting (*Southern Australia*). See p. 377.

79? **Ackama** A. CUNN.—Flowers minute; receptacle shortly cupulate. Sepals 5, 3-angular valvate persistent. Petals 5, linear-spathulate thin deciduous, inserted with stamens outside a slightly perigynous disk, divided into 5 oppositipetalous 2-lobed scales. Stamens 10, 2-seriate; filaments free, inflexed at subulate apex;

anthers introrse, sometimes apiculated by connective. Germen almost wholly superior; cells 2, 3, ∞-ovulate; styles slender recurved, persistent. Capsule small turgid, septicidally 2, 3-valved; valves boat-shaped, gaping within above. Seeds ∞, ovoid, laxly pilose outside; albumen fleshy scanty; embryo axile cylindrical.—Small trees; leaves opposite imparipinnate; leaflets sharply serrate; stipules deciduous; flowers numerous, ebracteate, in much branching cymiferous racemes (*Australia, New Zealand*). See p. 378.

80? **Spiræopsis** MIQ.—"Flowers diœcious; male calyx free, 5–6-partite, valvate persistent. Petals 5, 6, subequal to calyx, inserted outside pitted urceolate subcrenulate annular disk. Stamens 10–12, inserted with petals, 2-seriate; filaments exserted; anthers subglobose-2-dymous; connective produced beyond cells. Germen sterile small hirsute. Perianth of female flower same as in male. Stamens 0. Germen ellipsoid, surrounded by disk at base, 2-celled; styles 2, free, patulous, capitellate at stigmatose apex; ovules few, 2-seriately inserted in internal angle of cells, oblong imbricate. Capsule 2-celled; cells gaping inside; seeds ∞, fusiform, membranous-winged on both sides, imbricate.—A stellate-tomentose tree, resinous-punctate; leaves opposite petiolate imparipinnate; leaflets 2, 3-jugal opposite, elliptical or ovate-oblong, acuminate serrate coriaceous, covered above with stellate hairs, beneath with peltate scales; flowers in large compound axillary and terminal many-flowered panicles; males lax; females denser" (*Celebes*). See p. 378.

81? **Davidsonia** F. MUELL.—Flowers 4, 5-merous; sepals thick valvate. Stamens 8–10; filaments free short, inserted under narrow ciliate disk; anthers introrse 2-rimose. Germen free, 2-celled; styles 2, free, setaceous, apex stigmatose minute. Ovules generally 6–8 in each cell, inserted in edge of orbiculate placenta, afterwards descending. "Fruit dry dehiscent; cells 2, 1-seeded. Seed descending; cotyledons of exalbuminous embryo straight plano-convex; radicle very short superior."—A tree (stinging); leaves alternate imparipinnate; stipules herbaceous; flowers small glomerate-spicate in large branching racemes axillary to higher leaves (*North Eastern Australia*). See p. 378.

aril (?).—Heath-like undershrubs; leaves linear or acicular; superior (coloured) involucrating solitary terminal flowers or many-flowered capitula; stipules gland-like very small (*South Africa*). See p. 383.

87. **Audouinia** Ad. Br.—Receptacle obonical; perianth and androceum nearly of *Staavia*. Germen partly inferior 3-celled; ovules 2 in each cell, collaterally descending; raphe dorsal; style columnar, 3-gonous, 3-furrowed; apex stigmatose hollow, 3-crenate. Fruit...?—An undershrub; leaves alternate linear, imbricate; stipules very small; flowers in oblong terminal spikes, 3, 4-bracteate at base (*South Africa*). See p. 384.

88. **Linconia** L.—Flowers of *Audouinia*; anthers sub-3-angular hastate; cells oblique divaricate; connective produced to a conoid gland. Germen 2-celled; styles 2, stigmatose at apex; ovules 2 or 1 in each cell; one cell more rarely effete. Fruit 2-coccous; cocci dehiscent within. Seeds 1, 2, having a cupuliform aril (?) at apex. —Branching undershrubs; leaves spirally imbricate, 3-quetrous, glandular-ustulate at apex; stipules of same form, very small; inflorescences of *Audouinia*; bracts 3–5, large coriaceous, involucrate (*South Africa*). See p. 384.

89. **Berzelia** Ad. Br.—Flowers nearly of *Brunia*, 4, 5-merous. Germen half-inferior, 1-celled, 1-ovulate; style simple, sometimes arcuate and furrowed; apex stigmatose unsymmetrical. Fruit dry, obconical or turbinate, indehiscent. Seed 1 (*Brunia*).—Heath-like shrubs; alternate small leaves and globose capitula of *Brunia*; bracts spathulate or clavate (*South Africa*). See p. 384.

90? **Lonchostoma** Wickstr.—Flowers hermaphrodite; receptacle shortly obconical. Sepals 5, ovate obtuse, or linear-subulate, perigynous. Corolla gamopetalous, tubular, deeply 5-lobed; lobes oblong-lanceolate or spathulate, closely imbricate. Stamens 5, inserted in throat of corolla; filaments very short; anthers oblong-subhastate, 2-rimose introrse. Germen half-inferior, 2-celled; styles 2, stigmatose at unthickened apex, united to a variable height. Seeds 2–4, 2-seriate on ventral angle of each cell, descending; micropyle extrorse

superior; funicle short, thickened into an obturator. Capsule nearly free, 2–4-seeded, 2–4-valved from base. Seeds ovoid reticulate, suspended from thick funicle.—Branching twiggy shrubs; leaves alternate sessile, concave coriaceous, silky at back imbricate; flowers in terminal spikes, each flower solitary in axil of upper leaves of twig (*South Africa*). See p. 384.

91. **Thamnea** SOLAND.—Flowers nearly of *Brunea;* receptacle obconical or subspherical ventricose, glandular or warty outside, enveloping germen. Sepals, unguiculate petals, and included stamens 5, nearly of *Brunia*. Germen spuriously 1-celled, or imperfectly 2-celled; septum thin more (*Tittmannia*) or less slowly evanescent; ovules 2–4 in each cell, forming a false verticil on top of placenta (which adheres to top of cell), descending; micropyle afterwards extrorse superior. Fruit nucamentaceous, 1-seeded. Seed of *Brunia*. —Low slender heath-like shrubs or undershrubs; leaves small spirally inserted, at apex callous glandular, imbricate; stipules 2, minute gland-like; flowers solitary axillary sessile (*Tittmannia*), or terminal; stipe sometimes few-leaved axillary short (*South Africa*). See p. 385.

XVI. HAMAMELIDEÆ.

92. **Hamamelis** L.—Flowers hermaphrodite or often polygamous. Receptacle cupuliform. Sepals 4, free or connate at base, inserted in edge of receptacle; præfloration alternately imbricate. Petals 4 (or in male flower 0), alternate elongated linear strap-like; præfloration involute. Stamens 4, perigynously inserted with petals and alternating with as many oppositipetalous rather fleshy staminodes; filaments free rather thick, continuous with connective; anthers basifixed introrse; cells 2, dehiscing by 1 or more rarely 2 (*Loropetalum*) valves. Germen (in male flower rudimentary) inserted in bottom of receptacle, to a great extent free, 2-celled; styles 2; apex stigmatose, obtuse or capitellate; ovules 2 in each cell, collaterally descending; one soon abortive; micropyle of fertile anatropous introrse superior, afterwards extrorse lateral. Fruit capsular, semi-superior or nearly altogether superior, stipitate to receptacle at base,

woody, loculicidally 2-valved at apex; endocarp subcorneous parting from exocarp, 2-valved. Seeds oblong; testa crustaceous shining; albumen fleshy; radicle of axile straight embryo terete superior; cotyledons oblong flat.—Small trees or shrubs; leaves alternate petiolate unequal at base, ovate or subrotundate, crenate-dentate, penniveined; secondary venules straight subparallel to margin; stipules 2, lateral; flowers axillary or lateral on wood, spuriously glomerate, few pedunculate; bractlets few involucrant (*North America, Japan*). See p. 386.

93. **Corylopsis** SIEB. & ZUCC.—Receptacle concave; sepals 5, inserted at edge, valvate. Petals 5, obovate-spathulate perigynously inserted with alternate sepals. Stamens 5, alternipetalous, perigynous with as many alternate truncate squamules (staminodes ?); filaments subulate; anthers basifixed, longitudinally rimose or valvicidal. Germen (*Hamamelis*) half superior; branches of style 2, filiform, capitate at stigmatose apex. Capsule woody, 2-cuspidate; valves 2, 2-fid, sometimes with receptacle subbaccate at base; endocarp horny separating. Seeds of *Hamamelis*.—Shrubs; aspect and leaves nearly of *Hamamelis* (or *Corylus*); stipules large caducous; flower (precocious) in axillary pendulous racemes; bracts membranous; inferior large (*Mountainous India, China, Japan*). See p. 388.

94. **Dicoryphe** DUP.-TH.—Receptacle cylindrical; calyx subtubulose, 4-dentate (more rarely 5-dentate), valvate. Petals 4 oblong-linguiform thick. Stamens 8; alternipetalous sterile; fertile 4 erect; filaments thick subulate; anthers basifixed oblong, introrse completely or incompletely valvicidal. Germen adnate to bottom of receptacle, 2-celled; styles 2, simple at stigmatose apex; ovules (of *Hamamelis*) 2 in each cell; one finally abortive. Capsule adnate to receptacle, 2-horned at exserted vertex, septicidally 2-valved; valves afterwards split behind; endocarp horny dividing into 2-valved cocci. Seeds descending; testa crustaceous (blackish shining); albumen fleshy or subcorneous; cotyledons of inverted embryo subfoliaceous, recurved at edges; radicle cylindrical.—Shrubs; branches virgate; leaves alternate or opposite, entire coriaceous; stipules foliaceous unequal, sometimes large, subcordate at base; flowers

lary shortly pedunculate; bracts dentate or fimbriate (*Hongkong*). See p. 391.

98. **Sycopsis** Oliv.—Flowers monœcious, apetalous. Male calyx short, irregularly and obliquely dentate or lobate. Stamens 8, inserted in rather concave receptacle; filaments short thick, continuous with connective; anthers basifixed oblong-acute, longitudinally rimose. Germen rudimentary, 2-fid. Receptacle of female flower urceolate; calyx 4, 5-lobed, deciduous, inserted in throat of receptacle minutely scaly-pilose inside at base. Germen half-superior, adnate to receptacle at base within; cells 2 (of *Hamamelis*); branches of bipartite style, canaliculate stigmatose within, closely surrounded at base by throat of receptacle. Fruit... ?—A glabrous tree (?); leaves alternate petiolate oblong-lanceolate entire coriaceous, persistent; stipules small lanceolate, caducous; flowers of both sexes small, often intermixed, stellate tomentose, in short axillary racemes or glomeruli; bracts cucullate covering flowers (*Khasia*). See p. 391.

99. **Parrotia** C.A. Mey.—Flowers apetalous. Receptacle concave; lobes of subcampanulate calyx inserted in mouth 5–7, coriaceous persistent. Stamens 6, 7, opposite calyx-lobes; filaments filiform perigynous; anthers basifixed, longitudinally dehiscent, connective muticous or mucronate. Germen half inferior, adnate at base to receptacle; cells and style (of *Hamamelis*) simple at stigmatose apex. Half-superior capsule and seeds of *Hamamelis*.—Trees or shrubs; leaves oblong or orbicular, crenate deciduous; stipules large deciduous; flowers (precocious) capitate or shortly spicate; bracts large membranous involucrate (*Persia, Cashmere*). See p. 391.

100. **Distylium** Sieb. & Zucc.—Flowers polygamous, apetalous; calyx (sometimes very small) free, 3–6-partite; lobes unequal, imbricate. Stamens 2–8, hypogynous; filaments elongated free; anthers basifixed, oblong, longitudinally rimose. Germen (in male flower rudimentary, 2-fid) inserted on minute receptacle, free 2-lobed; 2-celled; ovules of *Hamamelis;* styles 2, subulate, capitellate at stigmatose apex. Capsule superior oblong or ovoid, 2-cuspidate, 2-valved at apex; valves 2-fid; endocarp horny, parting from exocarp,

2-valved. Seeds nearly of *Hamamelis*.—Glabrous or pubescent trees; leaves alternate coriaceous ovate or oblong-lanceolate entire; stipules lanceolate caducous; flowers (small) in axillary straight rather short spikes (*Mountainous Khasia, China, Japan*). See p. 392.

101. **Fothergilla** L.—Flowers apetalous; receptacle subcampanulate. Calyx very small, inserted in edge of receptacle, obscurely and unequally-repand-4–7-dentate. Stamens ∞, inserted with calyx; filaments free elongated-subclavate, exserted; anthers short; cells 2, lateral, valvicidal. Germen adnate to receptacle, 2-celled; styles 2, subulate, simple at stigmatose apex; ovules solitary in each cell, descending; micropyle introrse superior, finally lateral. Capsule subcartilaginous, 2-valved at apex; valves beaked, 2-fid. Seeds 1, 2 (of *Hamemelis*). A stellate-pubescent shrub; leaves alternate obovate crenate, deciduous; stipules lateral small; flowers (precocious) in dense spikes; bracts herbaceous (the lower ones sometimes 3-fid) deciduous (*North East America*). See p. 392.

102. **Disanthus** Maxim.—Flowers hermaphrodite; receptacle cupuliform. Sepals 5; obtuse, concave, transparent, imbricate, revolute on anthesis. Petals as many alternate, long and narrowly fan-shaped from dilated base, finally stellately spreading. Stamens 5, inserted with alternate petals in throat of receptacle; filaments short; anthers extrorse; cells externally rimose, confluent at apex; valves finally patent. Germen inserted in bottom of receptacle, partly inferior; cells 2, tapering into erect styles; ovules generally 6, 2-seriately inserted on internal angle, descending. Capsule loculicidal; endocarp cartilaginous parting from exocarp. Seeds few, unequal; embryo...?—A glabrous tree (?); leaves alternate suborbiculate-cordate petiolate entire 5-ribbed; stipules scarious, caducous; capitula axillary small pedunculate; flowers sessile paired at top of peduncle; obvallate by very short bracts at base (*Japan*). See p. 393.

103. **Rhodoleia** Hook.—Flowers hermaphrodite asymmetrical; receptacle concave. Calyx very short or nearly absent, usually annular surrounding edge of receptacle on outside. Petals 2–5, unguiculate oblong lanceolate, unequal, 1-lateral, usually deficient in interior flowers. Stamens 5–10, perigynously inserted with petals;

filaments unequal free; anthers basifixed oblong, subintrorse 2-rimose. Germen half-inferior; branches of bipartite style linear-subulate, simple at stigmatose apex, deciduous; placentas 2, parietal, sometimes contiguous at middle (not at base or apex); ovules ∞, 2-seriate on each placenta. Capsule subligneous, 2-valved; valves finally 2-fid. Seeds ∞, compressed, imbricate; testa crustaceous; embryo...?—Glabrous small trees; leaves alternate crowded at ends of twigs, exstipulate-petiolate, oblong or elliptical, entire coriaceous, glaucous beneath; flowers capitate; capitulum axillary pedunculate nodding, surrounded by ∞ coloured involucrant imbricate bracts; bracts gradually shorter externally (*China, Sumatra*). See p. 393.

XVII. LIQUIDAMBAREÆ.

104. **Liquidambar** L.—Flowers 1-sexual or polygamous. Male flowers bare; stamens ∞, glomerate into a globose capitulum; filaments short, surrounded at base by shortly prominent ring; anthers basifixed, oblong or obcordate, marginally 2-rimose. Receptacle of female flower concave; ring (perianth?) short inserted in edge. Stamens ∞, sometimes few or 0; filaments short; anthers small (sometimes fertile). Germen at base or to a great extent adnate to receptacle; cells 2; complete or incomplete; placentas 2, ∞-ovulate; branches of style 2, at apex stigmatose recurved and furrowed within. Fruit compound globose indurated, bristling with indurated styles, or smooth by their fall (*Altingia*), ∞-capsular; capsules free above, septicidal, gaping at apex; valves entire beaked, or 2-fid (*Altingia*). Seeds ∞, angulate-compressed, shortly winged; testa crustaceous; albumen fleshy thin; cotyledons of rather fleshy embryo oblong flat; radicle terete.—Trees (abounding in balsamic juice); leaves alternate petiolate palmatilobate glandular-serrate, deciduous; stipules lateral, deciduous; flowers capitate; capitula involucrate by 4 bracts or 1 (*Altingia*); males usually ramose or spicate; females solitary (*Asia Minor, East India, Malay, China, warm Tropical North America*). See p. 394.

105. **Bucklandia** R. Br.—Flowers polygamous; receptacle concave subcampanulate. Calyx marginal, unequally annular or thickly

repand-5-lobed. Petals (?) in female or hermaphrodite flower 4 or more, linear or spathulate, rather fleshy; in hermaphrodite flower ∞, larger (staminodes?). Stamens fertile in male flower, ∞; filaments subulate unequal; anthers basifixed; cells longitudinally rimose, afterwards 2-valved; connective apiculate. Germen half-inferior; cells 2, complete or incomplete; ovules usually 6 in each cell, 2-seriate descending; styles recurved, within flat stigmatose. Capsules subcapitate nearly free, woody; valves 2, 2-fid; endocarp bony shining fragile. Seeds about 6 in each cell; superior smaller subosseous sterile; inferior convex-3-gonous, winged above; cotyledons of rather fleshy embryo oblong; radicle conical.—Glabrous trees; branches articulated at nodes; leaves alternate petiolate broadly ovate-acuminate cordate entire coriaceous; younger large, 3-cuspidate; ribs radiating at base of blade; stipules broadly oblong coriaceous, involving younger leaves and flowers, soon deciduous; flowers capitate; capitula pedunculate corymbose; peduncles articulate (*Sumatra, East Himalaya, Khasia*). See p. 396.

XVIII. PLATANEÆ.

106. **Platanus** T.—Flowers monœcious; male calyx (?) formed of 3–6 minute leaves, hairy at apex. Squamules (?) 3–6, longer linear-clavate furrowed, lobate-truncate at apex, sometimes unequal or 0. Stamens as many alternate verticillate erect; filaments very short; anthers elongate-clavate; cells 2, laterally adnate, rimose at margin; connective capitate, truncate above cells. Sepals (?) of female flower 3–5, minute. Staminodes (?) as many obovate-clavate, longer capitate at apex; squamules as many alternate very small, sometimes absent. Carpels 2–8, verticillate, opposite the sepals, often adherent to them at base; germen ovoid-elongated, 1-celled, terminating in linear elongated style recurved at apex stigmatose within; ovule 1 (or rarely 2), descending below apex of ventral angle, suborthotropous. Fruit compound globose pedunculate pendulous; achenes ∞, coriaceous, surmounted by persistent style, surrounded by rigid hairs at base. Seed descending elongated orthotropous; testa thin; albumen fleshy; radicle of axile embryo

inferior terete; cotyledons subequal to radicle, oblong, sometimes of unequal lengths.—Trees, sometimes small; bark scaly broadly denuded; leaves alternate; petiole concealing axillary bud in conical hollow at dilated base; stipules 2 connate in 1, cyathiform, unequal-2-fid at dilated apex, closely surrounding twig at tubular base above insertion of petiole; limb lobed palmiveined; flowers (precocious) capitate; capitula globose, 1-sexual (rarely polygamous), 1 or few along distinct twig; capituliferous twigs terminal cernuous (*North America, Middle Asia*). See p. 397.

XIX. MYOSURANDREÆ.

107. **Myosurandra** H. Bn.—Flowers diœcious bare spicate, 4-merous. Male flower: stamens 4 (2 lateral); filaments free inserted in minute receptacle, slender elongated, finally nutant; anthers 2-celled, introrse, 4-locellate, 2-rimose; connective produced to a beak. Rudiment of germen 0. Female flower: germen free sessile, elongate-4-furrowed, 4-celled; cells 2, lateral, at apex free divaricated and tapering to slender recurved style, stigmatose and longitudinally furrowed within. Ovules ∞, 2-seriate along ventral angle, obliquely ascending, anatropous; micropyle extrorse inferior. Fruit 4-follicular; follicles more or less connate at internal angle, longitudinally dehiscent inwards, ∞-seeded. Seeds small descending; albumen copious; cotyledons of small axile embryo short inferior.—A glabrous balsamic-resinous shrub; branches virgate knotted; leaves opposite, connate at base to a free cylindrical sheath; stipules (?) 4, subulate, inserted in pairs in top of sheath; blade flabellate-cuneiform, at apex crenate or obtusely dentate, longitudinally folded; spikes terminal solitary; bracts opposite, 1-flowered; bractlets 2, lateral sterile (*Madagascar*). See p. 400.

108. **Myrothamnus** Welw.—Flowers diœcious, spicate (nearly of *Myosurandra*); males 3–8-, usually 5-androus; filaments 1-adelphous into a central erect column. Female flowers generally 3-merous; 2 cells posterior; styles subspathulate revolute. Capsule small coriaceous; carpels divaricated at apex, longitudinally dehis-

cent inwards.—A small balsamic-resinous shrub; aspect leaves and inflorescences of *Myosurandra* (*Tropical Western and Southern Africa*). See p. 402.

XX? DATISCEÆ.

109. **Datisca** L.—Flowers diœcious or more rarely (*Tricerastes*) polygamous. Receptacle of male flower very short rather convex; calyx short gamosepalous, 4–10-dentate. Stamens ∞; filaments free filiform, short or elongated; anthers basifixed oblong, laterally 2-rimose. Receptacle of female (or hermaphrodite) flower very concave, ovoid or tubular. Calyx inserted in mouth, 3–6-dentate. Stamens in hermaphrodite flower ∞, inserted with perianth. Germen adnate to receptacle, 1-celled; styles terminal 3, 4, 2-fid or bipartite, papillose within; placentas as many alternating with styles, ∞-ovulate. Fruit capsular, narrowly oblong, 3–5-ribbed, gaping at apex between styles. Seeds ∞; testa striate, reticulate or impressed-punctate; hilum arillate; embryo cylindrical fleshy, axile in scanty albumen, or exalbuminous.—Glabrous herbs (like *Cannabis*); leaves alternate, imparipinnate or 3-sect; uppermost entire; leaflets lanceolate serrate; flowers in cymes or glomeruli; cymes axillary or grouped on elongated, simple or branching, axillary or terminal twigs (*The East, Warm North-west America*). See p. 402.

110. **Tetrameles** R. Br.—Flowers diœcious, 4-merous. Sepals of males ovate or oblong, equal or unequal; denticles sometimes interposed. Stamens 4, opposite; filaments elongated inserted around centrally depressed-4-lobed disk; anthers short, 2-dymous, introrse rimose. Receptacle of female flower tubular-4-gonous. Calyx 4-dentate, inserted in mouth. Germen adnate to receptacle, intruded at apex; styles 4 oppositisepalous, truncate at dilated apex, stigmatose within. Placentas 4, parietal, alternisepalous, ∞-ovulate. Capsule membranous, 4-furrowed, many-seeded, dehiscent at apex between styles. — A lofty tree; leaves alternate; deciduous, long-petiolate, ovate or cordate-rotundate acuminate, subentire or dentate; flowers (precocious) in slender elongated

branching many-flowered racemes; peduncles and pedicels hirtellate (*East India, Java*). See p. 404.

111. **Octomeles** Miq.—Flowers diœcious, 8-merous. Receptacle of male flower concave hemispherical; calyx 8-dentate. Petals (?) 8, small, alternate, inserted with calyx in throat of receptacle. Stamens 8, oppositisepalous; filaments free, dilated at base; anthers large recurved, laterally 2-rimose. Receptacle of female flower tubular, obscurely 8-gonous, bearing calyx at dilated apex. Germen adnate to receptacle, concave at apex, crowned with 8 oppositisepalous divaricated styles, dilated at stigmatose apex; placentas 8, parietal, alternisepalous, more or less prominent within, ∞-ovulate. Fruit coriaceous; seeds ∞...?—A lofty tree, lepidote-furfuraceous; twigs thick; leaves long-petiolate cordate-acuminate entire; flowers in simple robust much elongated axillary cernuous racemes (*Indian Archipelago*). See p. 405.

XXII. PIPERACEÆ.

I. SAURURUS SERIES.

The Peppers (figs. 497, 503–513) alone long constituted the order *Piperaceæ*. But latterly other genera have been added,[1] and among

Piper (Eupiper) nigrum.

FIG. 497.
Fruiting branch ($\frac{1}{2}$).

them those forming the little group *Saurureæ*. The type thereof that has been longest known is the genus *Saururus*,[2] long repre-

[1] C. DC., *Prodr.*, xvi. sect. i. 235, 237.

[2] L., *Gen.*, n. 464.—ADANS., *Fam. des Pl.*, ii. 468.—J., *Gen.*, 19.—LAMK., *Dict.*, vi. 668; Suppl., iii. 347; *Ill.*, t. 276.—MIRB., in *Ann. Mus.*, xvi. t. 19.—RICH., *Dict. Class.*, xv. 195.—E. MEY., *D. Houttuynia et Saurureis*, 13.—TURP., in *Dict. Sc. Nat.*, Atl., t. 295.—ENDL., *Gen.*, n. 1824.—LINDL., *Veg. Kingd.*, 524, fig. 356 (2–4).—PAYER, *Organog.*, 425, t. 90; *Fam. Nat.*, 146.—LEM. & DCNE., *Tr. Gén.*, 500.—SCHNIZL., *Iconogr.*, t. 82.—C. DC., *Prodr.*, 238, n. 4.—*Mattuschkia* GMEL., *Syst.*, 589.

sented by a single species, *S. cernuus*[1] (figs. 498, 499), a perennial herb from the marshes of North America, often cultivated in our botanical gardens. Its flowers are small and numerous, whitish, hermaphrodite, regular, and achlamydeous. On the convex receptacle are inserted usually six stamens[2] below a central gynæceum.

Saururus cernuus.

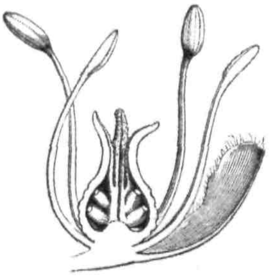

FIG. 498.
Long. sect. of flower ($\frac{1}{4}$).

FIG. 499.
Diagram.

Each stamen consists of a free elongated filament, and a basifixed introrse two-celled anther of longitudinal dehiscence. The superior gynæceum usually consists of four free carpels, two of which are lateral (fig. 499); each has a one-celled ovary, tapering above into a style, the apex of which is stigmatiferous internally. In the ventral angle of the ovary, which is not perfectly closed, is a parietal two-lipped placenta, each lip bearing one or two obliquely ascending orthotropous ovules with their micropyles superior.[3] In the fruit each ovary becomes a slightly fleshy, one-seeded berry. The seed, formed as in the Peppers, contains beneath its coat two albumens; one is large and farinaceous; the other, surmounting it, is much smaller and fleshy, surrounded by the embryo-sac, and envelopes a little embryo with a short superior radicle and thick cotyledons.

S. cernuus has a rhizome, from which spring the herbaceous annual

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[1] L., *Spec.*, ed. 2, 489.—RICH., in *Michx. Fl. Bor.-Amer.*, i. 218—NUTT., *Gen.*, i. 240.—TORR. & GRAY, *Fl. N.-Amer.*, i. 381.—A. GRAY, *Man.*, ed. 5, 427.—CHAPM., *Fl. S. Unit.-St.*, 398.—*S. lucidus* DON, *Hort. Cant.*, 66.—JACQ. F., *Ecl. Amer.*, 29, t. 18.—*Serpentaria repens* PLUKN., *Almag.*, 343.—*S. foliis profunde cordatis* L., *Hort. Cliff.*, 139. — *Mattuschkia aquatica* GMEL., *Syst.*, 589.

[2] In this case one stands anterior, one posterior, and two more on either side of the flower. The upper flowers have often a smaller number, or in our cultivated specimens from seven to ten.

[3] They have two coats.

branches, covered with alternate simple cordate petiolate leaves; the base of the petiole forms a stipuliform sheath at first enveloping the top of the twig, and in its upper part prolonged internal to the petiole, but without adhering thereto.[1] The branches terminate in long racemes; each flower is axillary to a bract which is carried up to the top of the pedicel (fig. 499), except in the case of the lower flowers, which are sessile, rendering this part of the raceme a spike.

Houttuynia cordata.

FIG. 500.
Inflorescence.

FIG. 501.
Flower ($\frac{2}{1}$).

FIG. 502.
Long. sect. of flower ($\frac{3}{1}$).

In the second species of the genus, *S. chinensis*,[2] from Eastern Asia, the general organization of the flowers is the same; but all are pedicellate; the stamens are shorter than the gynæceum, and have extrorse anthers.[3] We shall make this into a section of the genus *Saururus*, under the name of *Spathium*.

Houttuynia[4] (figs. 500–502) is closely allied to *Saururus*, and has its naked spicate flowers. It differs in the number of the stamens, usually three; their somewhat higher insertion, at a certain height

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[1] So that this superior free part of the sheath represents two connate stipules adnate to the petiole.

[2] H. BN., in *Adansonia*, x. 71.—*S. cernuus* THUNB., *Fl. Jap.*, 154 (nec L.).—*S. Loureiri* DCNE., in *Ann. Sc. Nat.*, sér. 3, iii. 102.—*Spathium chinense* LOUR., *Fl. Cochinch.*, ed. Ulyssip. (1790), 217.—*Saururopsis chinensis* TURCZ., in *Bull. Mosc.*, v. 21.—*S. Cumingii* C. DC., *Prodr.*, 239, n. 2.

[3] The filaments are articulated a little above the base.

[4] THUNB., *Fl. Jap.*, 12, 234 (nec SCHREB.).—J., *Gen.*, 25.—LAMK., *Dict.*, iii. 144; Suppl., iii. 65; *Ill.*, t. 739.—E. MEY., *De Houtt. et Saur.*, 1.—ENDL., *Gen.*, n. 1825.—LINDL., *Veg. Kingd.*, 521, fig. 356 (1).—PAYER, *Organog.*, 428, t. 90; *Fam. Nat.*, 147.—SCHNIZL., *Iconogr.*, t. 82.—C. DC., *Prodr.*, 238.—LEM. & DCNE., *Tr. Gén.*, 500.—*Polypara* LOUR., *Fl. Cochinch.* (ed. 1790), 61.

on the ovary itself[1] (figs. 501, 502); and in the individual carpels,[2] three in number, with multiovulate placentas.[3] The fruit is formed of three many-seeded follicles. *Houttuynia* comprises one species,[4] a herbaceous perennial from marshy localities in the south-east of Temperate Asia. It has alternate cordate petiolate leaves, with a dilated sheath like that of *Saururus*. The inflorescence is terminal, with each flower axillary to a bract; but while the upper bracts are small, the lower ones are large and petaloid, forming a sort of involucre at the base of the spike.

The same involucre is found in *Anemiopsis*,[5] a genus of similar floral organization, with usually six stamens and three carpels. But the flower is so inserted on the rachis of the spike that its ovary, far more inferior than in *Houttuynia*, is partially sunk therein when adult. *Anemiopsis* consists of Californian herbs, with the same station, habit, and inflorescence as in the preceding genera.[6]

Gymnotheca chinensis[7] has the habit, foliage, and inflorescence of *Houttuynia*. But its four carpels are united edge to edge into a one-celled ovary, surmounted by a style with four branches stigmatiferous internally and at the apex. With these alternate four multiovulate parietal placentas.[8] Towards the top of the ovary[9] are inserted the stamens, usually six in number, each with a short filament and an elongated basifixed two-celled anther of marginal dehiscence. Each flower has a bract at its base.

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[1] Really they are inserted on a receptacular cupule, in which is lodged the base of the ovary, here unilocular. Owing to the want of a perianth this cupule is almost undistinguishable when adult.

[2] Two are anterior; they are superposed to the stamens, which thus alternate with the placentas.

[3] The ovules are orthotropous, with two coats.

[4] *H. cordata* THUNB., *Fl. Jap.*, 234, t. 26.—W., *Spec.*, ii. 290.—*Bot. Mag.*, t. 2731.—*H. fœtida* LOUD.—*Polypara cochinchinensis* LOUR., *loc. cit.*

[5] HOOK. & ARN., in *Beech. Voy.*, *Bot.*, 390, t. 92.—ENDL., *Gen.*, n. 1825[1] (Suppl. i. 1374).—PAYER, *Organog.*, 427, t. 90; *Fam. Nat.*, 147.—C. DC., *Prodr.*, 237.—*Anemia* NUTT., in *Ann. Nat. Hist.*, i. 136.

[6] Only one species has been described, *A. californica* HOOK. & ARN.; but perhaps there is another inhabiting the same country.

[7] DCNE., in *Ann. Sc. Nat.*, sér. 3, iii. 100, t. 5.—C. DC., *Prodr.*, 237.

[8] The ovules are orthotropous, transverse or oblique.

[9] Or perhaps, rather, of an obconical receptacle enveloping the greater part of the carpels.

II. PEPPER SERIES.

The study of the Peppers[1] may be commenced by that of the Common- or Black-Pepper[2] (*Poivrier Commun*, or *P. Noir*; figs. 497, 503–506). Its flowers, hermaphrodite or unisexual, are in long spikes, each flower axillary to a bract. In the former kind, we see

Piper (Eupiper) nigrum.

FIG. 503.
Flowers ($\frac{4}{1}$).

FIG. 504
Diagram.

FIG. 505.
Fruit ($\frac{3}{1}$).

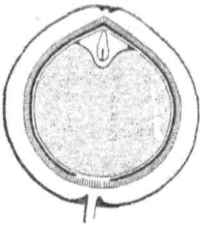

FIG. 506.
Long. sect. of fruit ($\frac{5}{1}$).

in a pit above the bract, edged by a prominent crest on either side,[3] a free gynæceum; on either side of this is a stamen, formed of a short, often flattened filament, inserted below the ovary, and a basifixed articulated anther, whose two adnate cells open by longitudinal clefts, then parting into four valves to free the pollen.[4] The ovary

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[1] *Piper* L., *Gen.*, n. 43 (part).—ADANS., *Fam. des Pl.*, ii. 262.—J., *Gen.*, 405.—GÆRTN., *Fruct.*, ii. 67, t. 92.—LAMK., *Dict.*, v. 457; Suppl., iv. 454; *Ill.*, t. 23.—ENDL., *Gen.*, n. 1820.—MIQ., *Syst. Piperac.*, Rotterd., 8vo. (1843, 44), 305.—SCHNIZL., *Iconogr.*, t. 81.—LEM. & DCNE., *Tr. Gén.*, 502.—C. DC., *Prodr.*, xvi. sect. i. 240.—*Saururus* PLUM. (part.) nec L. (incl.: *Artanthe* MIQ., *Callianira* MIQ., *Carpunya* PRESL, *Caulobryon* KL., *Chavica* MIQ. (part.), *Coccobryon* KL., *Cubeba* MIQ., *Enckea* K., *Heckeria* K., *Macropiper* MIQ., *Muldera* MIQ., *Nematanthera* MIQ., *Ottonia* SPRENG., *Potomorphe* MIQ., *Rhyncholepis* MIQ., *Schilleria* K., *Schizonephros* GRIFF., *Serronia* GAUDICH. & GUILLEM., *Sphærostachys* MIQ., *Steffensia* K., *Zippelia* BL.

[2] *P. nigrum* L., *Spec.*, 40.—W., *Spec.*, i. 159.—SPACH, *Suit. à Buffon*, t. 125.—MIQ. *Syst.*, 308; *Ill.*, 50, t. 50.—C. DC., *Prodr.*, 363 n. 502.—*P. spurium* LINK, *Jahrb.*, i. 3, 60.—*P.? colonum* PRESL, *Bot. Bem.*, 112.—*P. rotundum nigrum* PLUKN., *Almag.*, 297, t. 437, fig. 1.—*Lada, aliis Molonga* PIS., *Mant. Arom.*, 180, 181.—*Malago Cod* RHEED., *Hort. Malab.*, vii. 23, t. 12.

[3] At first sight they look like large depressed bractlets, but their absence in other allied types leads to the view that they are merely the raised edges of the pit hollowed out in the axis. They are figured as two lateral curves in the diagram (fig. 504).

[4] Generally formed of little ellipsoidal grains, with a longitudinal fold. (H. MOHL, in *Ann. Sc. Nat.*, sér. 2, iii. 311.)

is sessile,[1] one-celled, tapering above into a very short flask-shaped style, which soon divides into three, four, or more unequal reflexed stigmatiferous styles. In the cell is a little subbasilar placenta, bearing a single, nearly erect orthotropous ovule with its micropyle superior. The fruit or so-called Peppercorn (*grain de Poivre* ; figs. 505, 506) is a sessile one-seeded berry; and the seed contains within its coats a large farinaceous albumen (perisperm), whose apex is occupied by a second very small, fleshy albumen[3] (endosperm), enveloping a minute embryo, with a very short superior radicle, and broad depressed cotyledons. The Black Pepper is a slender climbing herbaceous plant, with knotty stems, bearing adventitious roots. The leaves, inserted at the swollen articulated nodes, are alternate simple petiolate, ovate-acuminate, penniveined, subtricostate at the base. The petiole is dilated below into a sheath which is prolonged into two intrapetiolar stipules; these separate at a certain age from the edge of the petiole and the branch, leaving a longitudinal and a circular cicatrix respectively. The inflorescences are long simple pedunculate spikes, leaf-opposed (fig. 497), or more rarely terminal.

Piper officinarum.

FIG. 507.
Fruit.

Other species, well known for their useful properties, such as Long-Pepper[4] (fig. 507), Betel[5] (fig. 509), Cubebs[6] (fig. 508), Kava[7]

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[1] It appears to be formed of a single carpel, and though the style divides above into several lobes, these would seem to represent parts of a single leaf. (See *Adansonia*, x. 140.) Here and there we find flowers with two or more carpels.

[2] But somewhat excentric, nearer the posterior side of the flower.

[3] The former is formed in the nucleus; the latter in the embryo-sac.

[4] *P. longum* L., *Spec.*, 41 (part.).—MIQ., in *Hort. Journ.*, v. 351; *Icon.*, t. 1928.—C. DC., *Prodr.*, 555, n. 474.—*P. longum Pistolochiæ* PLUKN., *Alm.*, 297; *Phyt.*, t. 104, fig. 4.—*Cattu Tirpoli* RHEED., *Hort. Malab.*, vii. 27, t. 14.—*Chavica Roxburghii* MIQ., *Syst.*, 239; *Ill.*, t. 30; *Icon.*, n. 256. We show below that *P. officinarum* L. (fig. 507) chiefly produces the Long Pepper of commerce.

[5] *P. Betle* L., *Spec.*, 40; *Fl. Zeyl.*, n. 27.—LAMK., *Ill.*, 79.—W., *Spec.*, i. 159.—C. DC., *Prodr.*, 359, n. 489.—*P. Melamiri* L. (part.).—*P. Siriboa* L., *Spec.*, 41.—*Sirii folium* RUMPH., *Herb. Amboin.*, v. 336, t. 116, fig. 2.—*Siriboa* RUMPH., *loc. cit.*, v. 340, t. 117.—*Codi* RHEED., *Hort. Malab.*, vii. 29, t. 15.—*Chavica Betle* MIQ., *Syst.*, 220.—MIQ., in *Ann. Mus. Lugd.-Bat.*, i. 136.—*C. auriculata* MIQ., *Syst.*, 269.—*Artanthe hexagyna* MIQ., *Syst.*, 412.

[6] *P. Cubeba* L. FIL., *Suppl.*, 90.—LAMK., *Ill.*, 81.—ROXB., *Fl. Ind.*, i. 161.—SCHNIZL., *Iconogr.*, t. 81, figs. 18–20.—C. DC., *Prodr.*, 340, n. 410.—*Cubeba officinalis* MIQ., *Comm.*, 33; *Syst.*, 285; *Ill.*, 48.

[7] *P. methysticum* FORST., *Pl. Esc.*, 76; *Prodr.*, n. 21.—W., *Spec.*, i. 161.—DELESS., *Ic. Sel.*, 53, t. 89.—GUILLEM., *Zeph. Tait.*, 28.—

&c., have the same general organization, and only differ in details. Thus Long-Pepper (*Poivre Long*) owes its name to the fact that its berries are arranged in a long cylinder, close-packed with one-another and the bracts; they are hence obpyramidal, and only free at the apex. In the Betel the bracts are rounded and peltate, and

Piper Cubeba.

Fig. 508.
Fruiting branch (½).

the leaves are pluricostate at the base. Cubebs has stipitate berries (whence its vulgar name of *Poivre à queue* [Tailed Pepper]), with bracts adnate to the rachis except at the edges, and penniveined leaves. Kava has pedicellate peltate crenulate bracts, and long-petiolate penniveined leaves, cordate and 11–13-costate at the base,

C. DC., *Prodr.*, 354, n. 470.— *Macropiper methyrticum* Hook. & Arn., in *Beech. Voy.*, *Bot.*, 96.—*M. latifolium* Miq., in *Linnæa*, xx. 130 (vulg. *Ava, Kava, Kawa-kawa*).

and surmounted by an acute acumen. The three central ribs are prolonged nearly to the apex. Other species of *Piper* again differ from the preceding in the number of stamens, which may rise from three or four to ten or twelve; in the anther, sometimes articulated with the apex of the filament; in the more or less complete separation or union of the sexes in the flowers, which may be monœcious or diœcious, or polygamous in a single stock or inflorescence, or more rarely all hermaphrodite on the same spike; in the position of the inflorescences on the branches; and in the behaviour of the floral bract to the axis. On these differences have been founded a large number of sections,[1] the limits of which however it is often impossible to define well in so natural a genus. As many as one thousand species have been described, which botanists have found it possible to reduce

Piper (*Eupiper*) *Betle*.

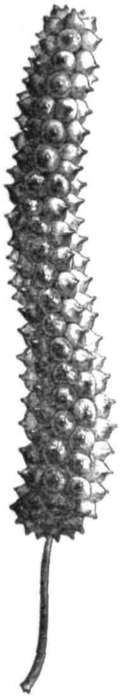

FIG. 509. Fruit.

Piper (*Steffensia*) *angustifolium*.

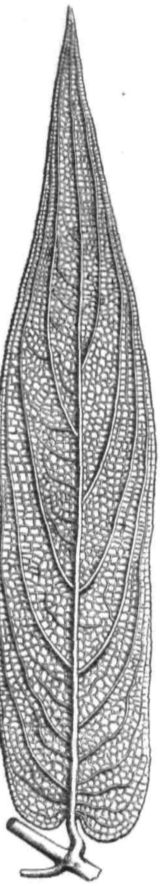

FIG. 510. Leaf ($\frac{2}{3}$).

[1] C. DE CANDOLLE admits nine, which we reduce to eight: 1. *Eupiper* [C. DC., *Prodr.*, 339; — *Piper* BL. (part.).; — *Chavica* MIQ., *Syst.*, 222 (part.);—*Cubeba* MIQ., *Comm.*, 35]. Bract free and distinct from the flower. Stamens 2, lateral, more rarely 3, with one posterior, or 4, with one anterior. Anthers articulate. Inflorescences leaf-opposed. Flowers unisexual or polygamous, more rarely all hermaphrodite (*Cocobryon* KL., and 2, 3-androus (123 sp.)—2. *Apopiper* (C. DC., *Prodr.*, 366). *Eupiper* with diandrous flowers, and exarticulate anthers (4 sp.). — 3. *Potomorphe* (MIQ., *Comm.*, 33; — *Heckeria* K., in *Linnæa*, xviii. 564;—*Macropiper* MIQ., *Comm.*, 35;—C. DC., *Prodr.*, 331). Flowers hermaphrodite or 1-sexual, 2, 3-androus. Inflorescences axillary or umbellate at apex of an axillary branch (12 sp.).—4. (?) *Carpunya* [PRESL, *Epimel.*, 229;—C. DC., *Prodr.*, 326;—*Ottonia* SPRENG., *N. Entd.*, i. 225 (part.);—*Schilleria* K., in *Linnæa*, xiii. 676;—*Enckea* K., *loc. cit.* (part.); — *Artanthe* MIQ., *Comm.*, 40

to some six hundred, of which some still seem to be of doubtful autonomy,[1] natives of the hot countries in all quarters of the globe.

Piper (*Enckea*) *discolor.*

FIG. 511. Inflorescence.

FIG. 512. Portion of inflorescence, enlarged (¼).

All the *Pipereæ* were formerly included in the genus *Piper*. The other genera, after having been inordinately multiplied, are now reduced to very few, and are only distinguished by characters of but slight importance, such as the behaviour of the floral bract, the dehiscence of the anther, the mode of division of the style into stigmatiferous lobes, and even the consistency and structure of the stems. *Chavica*,[2] with the same stem-structure as *Piper*, has extrorse bivalve anthers, from two to four in number;[3] *Peperomia*[4] (figs. 513–515), and *Verhuellia*,[5] have a different histological struc-

(part.)]. Flowers hermaphrodite. Bract free. Stamens 3, one posterior. Inflorescences leaf-opposed (22 sp.).—5. *Steffensia* [K., in *Linnæa*, xiii. 609;—C. DC., *Prodr.*, 251;—*Schilleria* K., *loc. cit.*, 676;—*Enckea* K., *loc. cit.* (part.);—*Ottonia* SPRENG., *loc. cit.* (part.);—*Serronia* GAUDICH. & GUILLEM., in *Deless. Ic. Sel.*, iii. t 90;—*Peltobryon* KL. (ex MIQ., *Syst.*, 369);—*Artanthe* MIQ., *loc. cit.* (part.);—*Zippelia* BL., in *Rœm. et Sch. Syst.*, vii. 1614, 1651;—*Brachystachys* C. DC., in *Seem. Journ.* (1866);—*Macrostachys* C. DC., *loc. cit.* (part.)]. Inflorescences leaf-opposed. Flowers sessile or stipitate. Bract distinct from the flower. Stamens 4 (315 sp.).—6. *Enckea* [K., in *Linnæa*, xiii. 590 (part.);—C. DC., *Prodr.*, 243 (part.);—*Callianira* MIQ., *Syst.*, 344]. Char. of *Steffensia*, with hermaphrodite flowers, and 5, 6 stamens with articulate anthers surrounding the ovary (30 spo.).—7. *Nematanthera* (MIQ., in *Linnæa*, xviii. 606, t. 2;—C. DC., *Prodr.*, 367). Flowers monandrous, hermaphrodite. Anther articulate. Bract free (2 sp.).—8. *Schizonephos* (GRIFF., *Notul.*, iv. 383;—C. DC., *Prodr.*, 241;—*Muldera* MIQ., *Comm.*, 34). Flowers enclosed in a cupule formed (?) of connate bracts, polygamous or 1-sexual. Anthers articulate. Inflorescences leaf-opposed (9 sp.).

[1] C. DC., *Prodr.*, *loc. cit.*, 241-380, 384–389, 492.

[2] MIQ., *Syst.*, 222 (part.).—C. DC., *Prodr.*, 388.

[3] All are natives of Tropical Asia and the East Indies, especially the mountainous districts of Silhet, Khasia, Sikkhim, Java, and the Moluccas (5 sp.: MIQ., in *Zoll. et Mor. Verz.*, 84; *Fl. Ind.-Bat.*, i. p. ii. 42.—DIETR., *Sp.*, i. 145.—C. DC., *loc. cit.*).

[4] R. & PAV., *Prodr.*, 8; *Fl. Per. et Chil.*, i. 29.—TURP., in *Dict. Sc. Nat.*, Atl., t. 293, 294.—H. B. K., *Nov. Gen. et Spec.*, i. 60.—MIQ., *Syst.*, 63.—ENDL., *Gen.*, n. 1820 a.—C. DC., *Prodr.*, 392.—*Dugagelia* GAUDICH., in *Freycin. Voy.*, *Bot.*, 513, 514.—C. DC., *Prodr.*, 471.—*Acrocarpidium* MIQ., in *Diar. Inst. Nederl.* (1842).—*Tildenia* MIQ., *loc. cit.*—*Erasmia* MIQ., *loc. cit.*—*Phyllobryon* MIQ. *Syst.*, 50.

[5] MIQ., *Syst.*, 47 (part.); *Ill.*, 5, t. 1, fig. *a.*—C. DC., in *Mém. Soc. Genève*, xviii. p. ii. t. 1, fig. 58; *Prodr.*, 391.—*Mildea* GRISEB., *Cat. Pl. Cub.*, 63.—*Piperoides* C. DC., in *Seem. Journ.* (1866), 161.

ture;[1] the former[2] has hermaphrodite flowers, and anthers of *Chavica;* the latter,[3] anthers of *Piper.* In both the floral bract is free. All these genera inhabit the hottest countries of the globe. *Verhuellia* comprises three or four species, all American, except one from the banks of the Nile. *Peperomia* is a very large genus; upwards of four hundred species have been described. In some there is a distinct style, in others the stigmatic papillæ are merely on top of the ovary; in some the flower and fruit are stipitate, in others sessile. Further divisions have been founded on the form of the stigmatiferous surface, which may be entire and discoidal, scutellate, conical, or elongated, or bilobate; on the insertion of the floral bract, which may be like a little leaf and attached by its base to the rachis, or dilated above and more or less peltate; on the arrangement of the leaves, alternate or verticillate; on their nervation, penniveined, multiplicostate, or pluricostate at the base.

Peperomia blanda.

FIG. 513. Habit.

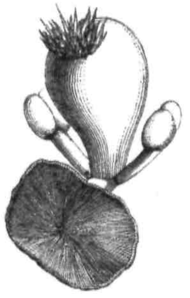

FIG. 514. Flower $(\frac{6}{1})$.

FIG. 515. Long. sect of flower.

[1] These peculiarities will be treated below, with respect to the organization of the stems.

[2] Low herbs, American and African (4 sp.: W., *Spec.*, i. 165 (*Piper*).—SPRENG., *Syst.*, i. 117 (*Piper*).—SW., *Fl. Ind. Occ.*, i. 69 (*Piper*).—DIETR., *Sp.*, i. 162 (*Peperomia*).

[3] Herbs or shrubs from all hot countries (389 sp., C. DC., *Prodr.*, 393–471).

III. CHLORANTHUS SERIES.

Chloranthus[1] (figs. 516–519) has small flowers axillary to opposite bracts on the rachis of a spike. Each has a one-celled ovary, surmounted by a short style, more or less irregularly dilated at its

Chloranthus inconspicuus.

FIG. 516.
Flowering branch.

FIG. 517.
Flower ($\frac{5}{1}$).

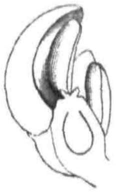

FIG. 518.
Long. sect. of flower.

stigmatiferous apex. Inside is inserted on the wall of the ovary, usually close to its apex,[2] a single descending orthotropous ovule, with its micropyle inferior.[3] This ovary must be

[1] SW., in *Phil. Trans.*, lxxvii. 354; *Prodr. Fl. Ind. Occ.*, 84.—J., *Gen.*, 423.—R. BR., in *Bot. Mag.*, t. 2190.—LINDL., *Veg. Kingd.*, 519, fig. 355.—ENDL., *Gen.*, n. 1819.—PAYER, *Organog.*, 422, t. 90.—C. J. DE CORDEM., in *Adansonia*, iii. 295.—H. A. DE SOLMS, in *DC. Prodr.*, xvi. sect. i. 473.—LEM. & DCNE., *Tr. Gén.*, 504.—SCHNIZL., *Iconogr.*, t. 80.—H. BN., in *Adansonia*, x. 134.—*Nigrina* THUNB., *Nov. Gen.*, 58; *Fl. Jap.*, 65; in *Act. Upsal.*, vii. 142.—LAMK., *Ill.*, 294.—POIR., *Dict.*, iv. 489.—*Creodus* LOUR., *Fl. Cochinch.*, 112.—*Peperidia* REICHB., *Consp.*, 212.—*Cryphæa* HAMILT., in *Brewst. Edinb. Journ. Sc.* (1825), 11.—*Stropha* NORONH., mss.

[2] Sometimes lower down. We have seen it occasionally inserted a little above the middle of the posterior wall, and in that case nearly horizontal. (See *Adansonia*, x. 141.)

[3] It has two coats.

considered as partly inferior, since it bears somewhere about half-way up the more or less prominent rim of the receptacular cup in which it is enframed. Here are inserted the perigynous male organs; they consist of a thick fleshy scale, concave towards the ovary. The median lobe bears the two cells of an introrse anther, each dehiscing by a longitudinal cleft, surmounted by a more or less marked prolongation of the connective. The anther borne on each of the lateral lobes is reduced to a single cell (fig. 518), also introrse and surmounted by an apiculus. It is still a moot point whether these flowers are hermaphrodite with a unilateral androceum, or really unisexual, in which case the three stamens would form a little cyme or glomerulus of monandrous flowers, placed on one side of a terminal female flower reduced to its gynæceum.[1] The fruit is a drupe with a thin fragile stone, and bears about half-way up a vestige of the rim that encircled the ovary in the flower. The seed is descending and orthotropous; it contains within its coats a copious farinaceous albumen, and near its apex a little embryo, with a short inferior radicle, and small thick more or less divaricated cotyledons.

Chloranthus inconspicuus.

FIG. 519. Diagram.

In certain species of *Chloranthus* the stem is frutescent, or sarmentose and almost climbing. The best known of these species that are woody (at least at the base) is *C. inconspicuus*,[2] an inhabitant of South-east Asia, often cultivated in our conservatories. Other species have creeping subterranean rhizomes, which give off herbaceous aerial branches. They are aromatic plants, from China and Japan. Among the Japanese species two are remarkable for the enormous elongation of the connective above the anther, to form a

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[1] C. J. DE CORDEMOY (*loc. cit.*, 288) considers "the flowers of *Chloranthus* as a true inflorescence, in which the axis bears at its extremity a single female flower, composed merely of a naked ovary, and laterally in the axil of a bract a little glomerulous (biparous sessile cyme) of male flowers, represented one by a bilocular stamen, and the others by unilocular stamens." DE SOLMS ascribes hermaphrodite flowers to *Chloranthus*, a view in which we thoroughly coincide (*Adansonia*, x. 143).

[2] SW., in *Phil. Trans.*, *loc. cit.*, t. 15.—LHÉR., *Sert. Angl.*, t. 2.—C. J. DE CORDEM., *loc. cit.*, 295.—DE SOLMS, *Prodr.*, 474, n. 2.—? *C. obtusifolius* MIQ., *Fl. Ind.-Bat.*, 802.—*Creodus odorifer* LOUR.—*Nigrina spicata* THUNB. (? ?).—*N. spicifera* LAMK., *Ill.*, t. 71.

coloured narrow subulate tongue. It has been proposed to make them into a distinct genus *Tricercandra*,[1] which we also admit only as a section of *Chloranthus*.

Sarcandra[2] has also a frutescent stem, with all the organization of *Chloranthus*, except that its androceum is monandrous; for it possesses only the median two-celled stamen, anterior to the ovary.[3] Hence it has been made, not without reason, a mere section of *Chloranthus*.[4] The genus thus constituted[5] contains some half-score species,[6] with knotty articulate stems and branches, possessing an aromatic scent, like most of the organs, and bearing opposite decussate leaves; these have geminate lateral stipules, nearly free or united at the base with one another and the petiole, to form a very ill-developed sheath. The spikes are terminal, usually ramified.

Hedyosmum[7] (figs. 520–525) has unisexual flowers, with both sexes sometimes on the same plant, sometimes separated. The female flowers are formed nearly as in *Chloranthus*, possessing the same unilocular ovary, the same descending orthotropous ovule, and the same short style with a stigmatiferous head. Moreover the apex of the ovary bears three short thick rounded wings, alternating with its angles—two anterior and one posterior. Their morphological value is still uncertain. The male flowers are far more simple; they are represented by numerous naked cuneate stamens (fig. 521), which are inserted in a spiral along a common axis; each stamen has two cells, of marginal dehiscence, surmounted by a thick obtuse dilatation of the connective. The genus *Hedyosmum* comprises some twenty species shrubs and undershrubs from the warm

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1 A. GRAY, *Acc. of Bot. Spec. Jap.*, 318.—*Saintlegeria* C. J. DE CORDEM., in *Adansonia*, iii. 300.

2 GARDN., in *Calc. Journ. of Nat. Hist.*, vii. 348.—C. J. DE CORDEM., in *Adansonia*, iii. 301.

3 In *S. chloranthoides* GARDN., the fruit recalls the ovary in its external characters. The seed contains a very copious farinaceous albumen, with a subapical embryo, whose ovoid radicle is much better developed than the cotyledons. Around the latter is a little irregular pulpy mass, the rudiment of the fleshy amniotic albumen of *Piper*. The apex of the radicle ends in a little point.

4 DE SOLMS., *Prodr.*, 474.

5 CHLORANTHUS sect. 3. { 1. *Euchtoranthus*. 2. *Tricercandra*. 3. *Sarcandra*.

6 W., *Spec.*, i. 248, 503.—SPRENG., *Anl.*, iii. 620; *Syst. Veg.*, iii. 683.—SIEB. & ZUCC., in *Mem. Acad. Vindob.* (1846), 232.—BENTH., *Fl. Hongkong.*, 334.—BL., *Enum. Pl. Jav.*, i. 79 (*Ascarina*); *Fl. Jav.*, fasc. 8.—RŒM. & SCH., *Syst.*, iii. 29, 461, 567.—MIQ., *Fl. Ind. Bat.*, i. 802.

7 SW., *Prodr.*, 847; *Fl. Ind. Occ.*, 59.—ENDL., *Gen.*, n. 1817.—TURP., in *Dict. Sc. Nat.*, Atl., t. 287.—AG., *Theor. Syst.*, 240.—C. J. DE CORDEM., in *Adansonia*, iii. 302.—DE SOLMS, *Prodr.*, 479.—*Tafalla* R. & PAV., *Prodr.*, t. 29; *Fl. Per. et Chil.*, 270.

parts of America.[1] Their branches are opposite, articulated at the nodes. The leaves are opposite simple petiolate, each pair united at the base, for a whole internode, into a subcylindrical sheath embracing the branch, and bearing above two stipules[2] on either side, often

Hedyosmum arborescens.

FIG. 521.
Stamen ($\frac{6}{1}$).

FIG. 520.
Male inflorescence.

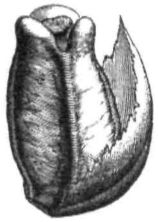

FIG. 522.
Female flower ($\frac{5}{1}$).

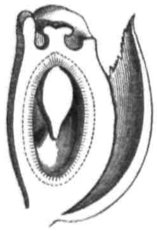

FIG. 523.
Long. sect. of female flower.

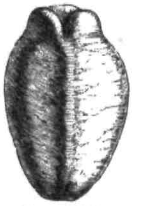

FIG. 524.
Fruit ($\frac{4}{1}$).

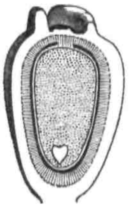

FIG. 525.
Long. sect. of fruit.

persistent after the fall of the rest of the leaf. The male catkins are solitary terminal, or grouped in terminal racemes, with opposite divisions. The female flowers are in little cymes or glomeruli, terminal, or again grouped into terminal racemes. In each cyme, biparous or triparous, there are as many axillant bracts as there are flowers, which by their union for some distance edge to edge form a sort of little involucre around the partial inflorescence.

[1] W., *Spec.*, iv. 476.—SPRENG., *Syst.*, iii. 865.—R. BR., in *Bot. Mag.*, t. 2190.—GRISEB., *Fl. Brit. W.-Ind.*, 172.—MART., *Fl. Bras.*, fasc. xi.—H. B. K., *Nov. Gen. et Spec.*, vii. 126, 165, t. 654, 655.—DON, in *Edinb. Rev.*, iii. 432.—KARST., *Fl. Columb.*, ii. 129, t. 168.

[2] Each of these is rather the free portion of the stipule, which is united below with the petiole and its fellow stipule into this sheath.

Ascarina,[1] finally, may be described as intermediate between *Chloranthus* and *Hedyosmum*. Of the former genus it has altogether the habit, leaves, inflorescence, ovary, and fruit. But its broad stigma is sessile; the gynæceum is axillary to a bract, accompanied by two sterile bractlets; and the unisexual flowers are diœcious. The male spikes consist of monandrous flowers as in *Hedyosmum*, with each stamen axillary to a bract. The two-celled anther tapers to the apex, and opens by two sublateral longitudinal clefts. The two or three species of *Ascarina*[2] inhabit the islands of Oceania.

IV. ? HORNWORT SERIES.

The Hornworts[3] (Fr., *Cornifle*; figs. 526–532) have monœcious

Ceratophyllum vulgare (demersum).

FIG. 527.
Male flower $(\frac{3}{1})$.

FIG. 529.
Long. sect. of fruit $(\frac{3}{1})$.

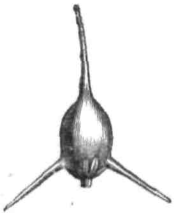

FIG. 528.
Fruit $(\frac{2}{1})$.

FIG. 526.
Flowering branch.

FIG. 530.
Embryo $(\frac{6}{1})$.

unisexual flowers. The males have a short convex receptacle, bear-

[1] FORST., *Char. Gen.*, 59.—J., *Gen.*, 482.—ENDL., *Gen.*, n. 1818.—C. J. DE CORDEM., in *Adansonia*, iii. 301.—DE SOLMS, *Prodr.*, 477.

[2] W., *Spec.*, iv. 647.—SPRENG., *Syst.*, i. 19.—HOOK. F., in *Journ. Linn. Soc.*, i. 127, 129.—SEEM., in *Bonplandia* (1861), 251; *Fl. Vit.*, 258, t. 74.

[3] *Ceratophyllum* L., *Gen.*, n. 1055.—J., *Gen.*, 18.—GÆRTN., *Fruct.*, i. 211, t. 44.—LAMK., *Dict.*, ii. 113; *Ill.*, t. 775.—SCHKUHR, *Handb.*,

ing a multifid perianth.[1] Inside this we find the indefinite stamens, each formed of a subsessile extrorse anther, dehiscing more or less completely by longitudinal clefts[2] (fig. 527). The females (figs. 531, 532) have the same receptacle and perianth; and the gynæceum consists of a free one-celled ovary tapering above into a long subulate style, undilated at its stigmatiferous apex.[3] Within the ovary and near its apex is a placenta bearing a suspended orthotropous ovule with its micropyle inferior. As the ovary grows two or three little points develop near its base, which enlarge and harden greatly in the fruit of certain varieties[4] (figs. 528, 529). The fruit is an achene,[5] containing a suspended orthotropous seed, with very thin coats and a large exalbuminous embryo. This is well-developed, a complete plant in miniature;[6] its short radicle is inferior; and the axis bears first the two large opposite cotyledons, and then a pretty large number of leaves, arranged like those on the stem,[7] and often possessing axillary buds.[8] *Ceratophyllum* comprises perennial aquatic herbs, submerged-natant, abundant in the fresh waters of Europe, North America, and the Antilles. Their branches are herbaceous, long and slender, covered with rigid brittle verticillate leaves, once or repeatedly di- or trichotomous, multifid

Ceratophylium vulgare (submersum).

FIG. 531.
Female flower ($\frac{3}{1}$).

FIG. 532.
Long. sect. of female flower.

iii. 254, t. 297.—DC., *Prodr.*, iii. 73.—NEES JUN., *Gen.*, viii. t. 11.—ENDL., *Gen.*, n. 1829.—LINDL., *Veg. Kingd.*, 263, fig. 178.—SCHLEID., in *Linnæa*, xi. 513, t. 11.—C. J. DE CORDEM., in *Adansonia*, iii. 292.—LEM. & DCNE., *Tr. Gén.*, 505.—*Hydroceratophyllum* VAILL., in *Act. Ac. Par.* (1719), t. 2, fig. 2.—*Dichotophyllum* DILLEN., *Gen.*, 91, t. 3.

[1] Its divisions are equal or unequal.

[2] The clefts may be well defined or irregular, or else of tardy occurrence. The apex of the connective is prolonged into one or two points above the cells.

[3] It is papillose on one side.

[4] Especially *C. demersum* L. (*Spec*, 1409).—*C. cornutum* RICH. (*Anal. Fr.*, 46, 93); while in *C. submersum* L. it is said that the prickles are quite absent. This is true of the flower in general, even where they are present and attain to a more or less notable development in the fruit.

[5] It is finally quite dry, but is really rather a drupe, with a very hard stone and a very thin exocarp, covered with little warty dots.

[6] Its development was first studied in 1827 by AD. BRONGNIART (in *Ann. Sc. Nat.*, ser. 1, xii. 251, t. 44, fig. B).

[7] The first pair above the cotyledons are usually simple, and were described by NEES as a third and fourth cotyledon.

[8] C. J. DE CORDEM., *loc. cit.*, 293. A trace of mucous albumen is often found between the folds of the embryo. Above, the seed bears a little brown chalazal cupule, much thicker than the rest of the seed-coats.

and exstipulate. The flowers are solitary axillary. Three or four species have been made;[1] but SCHLEIDEN[2] reduces them to varieties of a single species.

The twelve genera we admit in this order belong to four small series, the general characters of which we can now give.

I. SAURUREÆ.—Herbs, with hermaphrodite pluricarpellary flowers. Carpels superior or partly inferior, free altogether or partially, or united edge to edge below or all the way up into a one-celled ovary with several pluriovulate parietal placentas. Leaves alternate. Fruit dry. Albumen double. Fibro-vasculate system simple peripheral (4 genera). A. L. DE JUSSIEU,[3] who knew *Saururus* and *Houttuynia*, placed them both in Monocotyledons, the former in *Naiadeæ*, the latter in *Aroideæ*. L. C. RICHARD,[4] in 1808, proposed to make a distinct order of the *Saurureæ*, accepted by most subsequent authors.[5] C. DE CANDOLLE[6] has recently made it a tribe of the order *Piperaceæ*. The genera *Anemiopsis*[7] and *Gymnotheca*[8] were added in the second quarter of this century.

II. PIPEREÆ.—The genus *Piper* was classed by A. L. DE JUSSIEU[9] in the *Genera Urticis affinia*. A. P. DE CANDOLLE[10] made it a tribe of *Urticeæ* under the name of *Piperiteæ*. KUNTH, in 1815,[11] following the opinion of L. C. RICHARD,[12] made the *Piperaceæ* a distinct order. This was accepted by ENDLICHER in 1836[13] to include only the two types *Piper* and *Zippelia*;[14] besides, as doubtful members, *Ottomia* of SPRENGEL,[15] and *Laurea*, which is a true Urticad. Several genera proposed as distinct by GAUDICHAUD[16] were kept by ENDLICHER among the Peppers. Then MIQUEL made a particular study of this group,

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1 L., *Spec.*, 1419.—ŒD., *Fl. Dan.*, iii. t. 510., xii. t. 2000.—SOW., *Engl. Bot.*, t. 679, 947.—CHAM., in *Linnæa*, iv. 503, t. 6, 336.—A. GRAY, *Man.*, ed. 5, 427.—GREN. & GODR., *Fl. de Fr.*, i. 592.

2 *Loc. cit.*, 540 (*C. vulgare* SCHLEID.).

3 *Gen.* (1789), 19, 25.

4 *Anal. du Fruit* (1808), 41.

5 *Saurureæ* ENDL., *Gen.*, 266, ord. 82.—AD. BR., *Enum.*, 98, fam. 198.—AG., *Th. Syst.*, 93.—LEM. & DCNE., *Tr. Gén.*, 500.—*Sauruaceæ* LINDL., *Veg. Kingd.*, 521.

6 *Prodr.*, xvi. sect. i. 235–237 (1869).

7 HOOK. & ARN., in *Beech. Voy.*, *Bot.* (1841).

8 DCNE., in *Ann. Sc. Nat.*, ser. 3, iii. (1845).

9 *Gen.*, 405.

10 *Théor. Elém.* (1813), 218.

11 In *H. B. K. Nov. Gen. et Spec.*, i. 46.

12 *Anal. du Fruit* (1808).

13 *Gen.*, 265, ord. 81.

14 BL., in *Rœm. et Sch. Syst.*, vii. (1829).

15 *N. Entd.*, i. (1820).

16 In *Freycin. Voy.*, *Bot.* (1826), 513.

and in his memoirs[1] divided it into a large number of genera, which have only been considered sections of *Piper* and *Peperomia* by the most recent authors, especially C. DE CANDOLLE.[2] This botanist retains as distinct genera the two just mentioned, and *Verhuellia* and *Chavica*.[3] These four have the following characters in common: a single one-celled ovary, with a nearly basilar suberect orthotropous ovule; a one-seeded berry and a double albumen, just as in *Saurureæ*. The flowers are naked, unisexual or hermaphrodite, spicate or racemose. Of this series C. DE CANDOLLE makes two tribes, *Pipereæ* and *Peperomieæ*, according as the fibro-vascular system in the stem is simple or double.

III. CHLORANTHEÆ.—The genus *Chloranthus* was classed by A. L. DE JUSSIEU[4] with Loranthads, and by SPRENGEL[5] with Caprifoliads. R. BROWN[6] was the first to make it the type of a distinct order, retained as such by all recent botanists.[7] Nearly all have judged it akin to *Piperaceæ*, but they kept it distinct, while we include it in the latter order as a mere tribe or series. It is distinguished by the insertion of the ovule, near the apex of the posterior wall, instead of near the base of the ovary; and we have shown[8] that the ovule thus becomes descending instead of ascending. The direction seems also connected with the perigyny of *Chloranthus*, where the ovary is partly inferior. The flower is, according to our view, hermaphrodite, with a unilateral gynæceum.[9] This series also contains *Ascarina*,[10] left by

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[1] *Disput. Tax. et Geogr. de Piperac.* (*Comment.*, i.), Lugd. Bat. (1839); *Obs. de Piperac.* (*Comment.*, ii.), Lugd. Bat. (1840); *Syst. Piperac.*, Roterod. (1843–44), 8vo.

[2] *Mém. sur la Fam. des Piperacées* (in *Mém. Soc. Genève*, xviii. p. ii.); *Prodr.*, xvi. sect. i. 235 [65], ord. 186.

[3] Besides *Dugagelia* GAUDICH., which we have referred to *Peperomia*, and *Symbryon* GRISEB. (*Cat. Pl. Cub.*, 64), unknown to us, and considered by C. DE CANDOLLE (*Prodr.*, 471) as a doubtful genus. It is a knotty shrub, with alternate leaves and diclinous flowers. The females, alone known, have a single uniovulate ovary, surmounted by a sessile stigma, and accompanied by two lateral scales.

[4] In *Ann. Mus.*, xii. 299.

[5] *Anl. z. Kenntn. d. Gew.*, ii. 620.

[6] In *Bot. Mag.*, n. 2190 (1820); *Misc. Works* (ed. BENN.), i. 215; ii. 671 (*Chloranthea*).

[7] LINDL., *Veg. Kingd.*, 519, ord. 197 (*Chloranthaceæ*). — ENDL., *Gen.*, 264, ord. 80. — C. J. DE CORDEM., in *Adansonia*, iii. (1863), 280.—H. A. DE SOLMS, in *DC. Prodr.*, xvi. sect. i. 472, ord. 188.

[8] *Sur la Position des Chloranthacées* (in *Adansonia*, x. 138).

[9] This view is shared by most authors, and only confirmed by what we know of the flower in *Pipereæ*. However, C. J. DE CORDEMOY (in *Adansonia*, iii. 288) applies to *Chloranthus* the theory which gives *Euphorbia* monœcious flowers, and regards the stamens as a cyme (lateral trifloral biparous) of monandrous flowers, while the gynæceum represents a terminal female flower, whence his expression that in *Chloranthea* we have "pseudo-hermaphrodite flowers."

[10] FORST., *Char. Gen.* (1776).

JUSSIEU in the *Genera incertæ sedis*, and *Hedyosmum*,[1] wherein the receptacle is quite concave, and the flowers are diœcious.—Leaves opposite with lateral stipules, adnate to the receptacle, and sometimes to one another, for a long distance. Seed with a simple albumen in some species containing a rudiment of the fleshy mass[2] which is developed in the embryo-sac in *Pipereæ* and *Saureæ*.

IV? CERATOPHYLLEÆ.—A. L. DE JUSSIEU[3] made *Ceratophyllum* a Naiad. MIRBEL[4] first regarded it as the type of a distinct group, held by F. C. RICHARD[5] and SCHLEIDEN[6] a neighbour of *Coniferæ*. GRAY[7] made it into the order *Ceratophylleæ*, which DE CANDOLLE[8] placed near *Halorageæ*, *Hippurideæ*, and *Lythrariæ*, a view which has found the greatest support. ENDLICHER[9] classed it next to *Callitricheæ* and *Podostemaceæ*; LINDLEY[10] next the Nettles; AD. BRONGNIART[11] beside *Chloranthaceæ* and *Santalaceæ*; A. GRAY,[12] because of the structure of the embryo, near *Nelumbeæ* and *Cabombeæ*. C. J. DE CORDEMOY[13] thought it should be placed in the same tribe with *Chloranthеæ* and *Plataneæ*. We make it, not unhesitatingly, a series or tribe allied to *Chloranthеæ*. It is characterized by monœcious flowers; a circular gamophyllous perianth, incised into a variable number of lobes; a free one-celled ovary, containing a single, almost suspended, orthotropous ovule; a drupaceous fruit with a very thin mesocarp, and hard stone; an erect exalbuminous embryo,[14] so highly developed as to resemble a little plant, possessing leaves with axillary buds above the two large fleshy cotyledons. By this great development of the embryo the plants appear analogous in this order to *Nelumbeæ* in *Nymphæaceæ*.—Submerged swimming herbs; leaves verticillate, incised 2–3-chotomous, not aromatic. Flowers axillary sessile.

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1 Sw., *Prodr.*, *Fl. Ind. Occ.* (1788).
2 See p. 477, note 3.
3 *Gen.* (1789), 18.
4 Ex AG., *Theor. Syst.*, 55 (1858).
5 *Anal. du Fruit.*, 46, 93.
6 In *Linnæa*, xi. (1837), 540.
7 *Brit. Pl. Arr.*, ii. 554.
8 *Prodr.*, iii. (1828), 73, ord. 73.
9 *Gen.*, 267, ord. 83 (1836).
10 *Veg. Kingd.* (1846), 263, ord. 85 (*Ceratophyllaceæ*).
11 *Enum.* (1843), 115, fam. 240 ?
12 In *Ann. Lyc. N.-York*, iv. (1837), 48.
13 In *Adansonia*, iii. 293 (1863).
14 Sometimes the mucilaginous remains are left between the little leaves of the embryo. According to C. J. DE CORDEMOY, "the absence of albumen is not a character we can really use, for if we follow the development of the ovule, we think that at the time when it becomes a seed, and the embryo is present, there exists a true albumen." But the precocious growth of the plantule early exhausts the albumen; and, finally, the seed of *Ceratophyllum* resembles what that of *Chloranthus* must be when, after germination, it has attained the same grade of development."

Thus the variable characters by which we separate the series of this group are as follows: the structure of the seed, the number and direction of the ovules, the number of carpels, the presence or absence of the perianth, the form of the floral receptacle, and the characters of the vegetative organs. The points by which the genera are distinguished in the several series are, in *Chloranthеæ*, the hermaphrodism or dicliny of the flowers, the presence or absence of a floral bract in the males, and the depth of the receptacle and organization of the perianth in the females. In *Saururеæ:* the independence or union of the carpellary leaves, the adnation or independence of the floral bracts, the number of parts in the androceum and gynæceum, the form and depth of the floral receptacle. In *Pipereæ:* the dehiscence of the anthers (into two valves or four), and sometimes the number of divisions of the style, and lastly the structure of the stems. Rarely has such a character as the last been used in characterizing the tribes of an order, and this just proves its importance here. Long since was the attention of botanists called to the histological organization of the *Pipereæ* by their peculiar habit, their often sarmentose branches with prominent articulated nodes, by the insertion of the leaves, and the development of adventitious roots on certain parts of their stems.[1] MOLDENHAUER[2] noticed in 1812 that certain species have neither pith nor medullary rays. Since then it has been shown[3] that in the herbaceous stems and branches the fibro-vascular bundles are irregularly scattered through the cellular mass, as in many Monocotyledons. When the axes become woody a regular sheath of wood forms in the second year or vegetative season, surrounding the parenchymatous mass in which the first fibro-vascular bundles are isolated. Then in time the woody zone thickens, and is enlarged with new elements. Finally, "in the arborescent

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[1] In most *Pipereæ* where they occur they spring from the nodes. In *Piper Cubeba* and several others their primitive development is most regular. One root, formed of a hemispherical protuberance, bursting out through a crack in the bark, takes origin at one side of the base of the petiole. Its predecessor and successor spring from the opposite side of the petiole above and below respectively, and this alternation is continued along the whole branch.

[2] *Beitr. z. Anat. d. Pfl.* (1812), 5, not.

[3] DUVERN., *Unters. ueb. Keim... d. Monoc.*, 23, t. 1.—K., in *Mém. Mus.*, iv. (1818), 442; *Bemerk. ueb. d. Fam. d. Piperac.* (in *Linnæa* (1839), 561; in *Ann. Sc. Nat.*, ser. 2, xiv. 173).—E. MEY., *De Houttuynia atque Saurur.* (1827), 38, figs. 5–9.—BL., *Obs. sur la Struct. des Poivres* (in *Mém. Soc. Sc. Batav.*, xi. (1826), ex *Ann. Sc. Nat.*, ser. 1, xii. 216).—BISCH., *Lehrb.*, ii. 63.—TREVIR., *Phys. d. Gew.*, i. 210.—MEYEN., *Pflanz.-Phys.*, i. 332.

and frutescent species the wood is compact, in layers, traversed by large medullary rays." We find numerous variations in detail in the different species. UNGER[1] demonstrated in 1840 that some Piperads have two fibrovascular systems, a central and a peripheral. In the internodes their course is parallel, without anastomosis, but at the nodes they unite to form a plexus, whence the buds and roots take origin. Wood-formation is limited to the outer system, on the external surface of which are produced new bundles, composed of vessels and connective parenchyma.[2] Hence the stems only become hard and woody in those plants which possess an external fibrovascular system; they are herbaceous where there is only the primitive system with scattered bundles; thus it is that C. DE CANDOLLE[3] distinguishes *Peperomieæ* (herbaceous) from *Pipereæ* proper (woody). The perfect decussation of the leaves in *Chloranthea* leads to a regular arrangement of the bundles. In *Chloranthus inconspicuus* there were found[4] four large bundles arranged in a square, in each internode. "These four large bundles are separated, each from its neighbours, by a pair of smaller ones which join together. When the bundles are fully developed they have all the general characters of the Dicotyledonous stem. The anatomical structure of *Ceratophylleæ*[5] is quite peculiar, and correlated with their aquatic habitat. In the arrangement of its parts the stem recalls that of plants widely separated in other respects, but of submerged habit. Beneath the epiderm is a copious thick cortical parenchyma, with its cells full of pink liquid, or starch and chlorophyll. But its deeper layers are traversed by enormous tubular spaces filled with gas, separated from one another by vertical septa often consisting of a single stratum of

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[1] *Ueb. d. Bau und das Wachsth. d. Dicot. Stam.* Petersb. (1840).—MIQ., *Comm. Phyt.* (1838–40), 3; *Syst. Piperac.*, 5, 7; in *Mart. Fl. Bras.*, *Piperac.*, Anat. The author confirmed what was already known of the general structure of the stem. Studying this and that of the root in *Peperomia*, *Piper*, *Artanthe*, *Chavica*, *Tildenia*, he found that the medulla was traversed by fibrovascular bundles. The stem of an *Artanthe* revealed a score in transverse section, most widely scattered towards the centre. In the wood there were medullary rays of various generations, and dotted vessels.

[2] See also on this point: LINK, *Ic. Anat.*, ix. 9, 10.—LINDL., *Veg. Kingd.*, 515.—HENFR., *Elem.*, 533.—OLIV., *Stem in Dicot.*, 32 (in *Nat. Hist. Rev.*, iii. 251).

[3] *Mém. sur la Fam. des Pipéracées*; *Prodr.*, 235 [65].

[4] UNG., *Ueb d. Bau.* &c.—C. J. DE CORDEM., in *Adansonia*, iii. 286. This author found that in the young stem, at first cellular, there appeared "twelve fibro-vascular bundles, which soon united into eight, by the symmetrical junction of eight in adjacent pairs."

[5] SCHLEID., in *Linnæa*, xi. (1837), 530; *Grundz.*, i. 250; ii. 54, 142.

cells. The axis of the stem is occupied by close-packed elongated elements, which, perhaps, represent a woody zone, or rather a pith with its cells drawn out.[1] The leaves are remarkable for that the parenchyma with chlorophyll is only superficial, surrounding a very large central canal, here and there interrupted by thin transverse cellular septa.

Affinities.—The *Piperaceæ* are especially close to *Urticaceæ*, of which they often have gynæceum, placentation, and ovule, and sometimes, as in *Laurea,* habit, foliage, and inflorescence. But their perianth is different, save in doubtful cases, such as *Hedyosmum,* where the ovary is quite inferior, and *Ceratophyllum,* so distinct in all other features. Moreover, *Urticaceæ* lack the double embryo of most *Piperaceæ,* their aromatic odour, and the leafy embryo of *Ceratophyllum.* All the secondary groups that were formerly placed with *Piperaceæ* in *Urticineæ,* such as *Moreæ, Artocarpeæ, Ulmaceæ, Cannabineæ,* &c., have a gynæceum of more than one carpellary leaf and anatropous ovules, not to mention the characters of the habit and male flower. Through *Chlorantheæ* and *Ceratophylleæ* this order seems allied to *Hippurideæ,* and, as some have thought, to *Loranthaceæ.* But this last affinity, and that to *Polygonaceæ, Salsolaceæ,* &c., seems to us less evident, for all these types have a pluricarpellary gynæceum, with truly central placentation. *Piperaceæ* are, in the first place, inseparable from the Nettles. Next, by their more complicated types, they come very close to *Datisceæ.* If we compare *Gymotheca* and *Tetrameles* we shall see that their floral organization is fundamentally the same, except that the latter has a perianth. This closely connects *Urticaceæ* and *Saxifragaceæ,* which are also linked by *Myosurandreæ,* for, as we have already shown, *Myosurandra* has the branches, opposite leaves, odour, and inflorescence of *Chloranthus,* the sheaths and stipules of *Hedyosmum,* the naked flower of the *Pipereæ* and *Saurureæ,* the free carpels of several of the latter, with a ventral placenta, and differs in no absolute character but its anatropous ovules and single albumen.

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[1] Spiral vessels have been described in these plants, but we have been unable to find them.

Piperaceæ are, generally speaking, tropical plants, always excepting *Saurureæ* and *Ceratophylleæ*, chiefly spread over the temperate and cold parts of the Northern hemisphere. *Houttuynia* and *Gymnothecus* are exclusively Asiatic, and so is one species of *Saururus*; the other, like *Anemiopsis*, is confined to North America. In *Pipereæ* all the species of *Chavica* come from Tropical Asia and Java. *Verhuellia* is American, save one species from the banks of the Nile. *Piper*[1] and *Peperomia* are spread over all tropical and subtropical regions in both Worlds; but not evenly, for in 1849 MIQUEL described five hundred and twenty-one species, whereof three hundred and ninety-two belong to the New World, leaving only one hundred and twenty-nine to the Old. The latter are thus distributed: Africa, 19; Australia, 19; Asia, 91. Their limits are 35° N. lat., and 42° S. They are especially common in America within 30° S., and some species extend beyond the Tropic of Capricorn; in the Andes they become humble and herbaceous. In the Indian Archipelago and Malaysia they are nearly as numerous as in America; but their number diminishes on the continent of Asia; they are rare in the Himalayas and China. They are also rare in Australia, and extend up to 40° S. in New Zealand. They are also found at the Cape, but are far more common in Madagascar and the Mascarene islands; and a few species advance northwards as far as the Nile valley. All of them affect warm, damp, dark valleys, and the neighbourhood of watercourses; they are rare on heights.[2]

The various parts of most Piperads, and especially their leaves and fruits, are gorged with a peculiar essential oil, a more or less acrid resin, and a crystalline matter, which render them odoriferous and aromatic, pungent, stimulant, or irritant, or tonic, stomachic, and digestive. Hence they are used[3] as spices, condiments, and sialogogue aperients, or as drugs in fluxes, catarrhs, rheumatics, &c.

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[1] Of the genus *Piper* the whole section *Schizonephros* belongs to the Old World, while the sections *Enckea, Carpunya, Nematanthera*, are confined to the New. *Eupiper, Potomorphe*, and *Steffensia* are represented in both; while of the section *Apopiper* one species is American, the other is Australian.

[2] MIQ., *Syst.*, 37, 554 *bis*.—ENDL., *Enchirid.*, 150.

[3] ENDL., *Enchirid.*, 150.—LINDL., *Fl. Med.*, 310, 635.—GUIB., *Drog. Simpl.*, ed. 6, ii. 271.—ROSENTH., *Syn. Pl. Diaphor.*, 175, 1102.

Common Black-Pepper is the fruit of *P. nigrum*[1] (figs. 497, 503–506), indigenous in India, the cultivation of which has been essayed in nearly all tropical regions, especially Java and Sumatra. It is generally thought[2] that the same fruit, freed from the pericarp, constitutes the White Pepper of commerce, which, though less active,[3] is more used as a spice. Cubebs or Tailed Pepper, so much used in medicine for the same purpose as Copaiva, is the pedicellate fruit (fig. 508) of *P. Cubeba*,[4] a native of Java and Borneo. With it are sold under the same name the berries of *P. caninum*:[5] they are a little smaller, more oval, and end in a rostrate apiculum; besides being less aromatic, acrid and bitter, and with a stronger taste of Anise. Moreover the dry fruit is brownish-black, with well marked rugosities in *P. canina*, and the pedicel is of the same length as the fruit; while in *P. Cubeba* the fruit has a longer pedicel, and is black and scarcely rugose. In fine, *P. caninum* is less active than true Cubebs.[6] Long-Pepper, formerly used in making diascordium and theriaca, but in much less demand now-a-days either as a drug or a condiment, is the cylindrical compound fruit (fig. 507) of *P. longum*[7] and *officinarum*,[8] formed of a large number of sessile berries. The Betel of the East, whose leaves are used all over

[1] See p. 496, note 2.—NEES & EBERM., *Handb.*, i. 98; *Pl. Med.*, 21.—GUIB., *loc. cit.*, 272, fig. 414.—RÉV., in *Fl. Méd. du* xixe *Siècle*, iii. 98.

[2] "Such is the usually received opinion touching the origin of White-Pepper; however, it would seem from a passage of GARCIAS AB HORTO (DUJARDIN), supported by figures given by CLUSIUS (*Exot.*, 182), that the White-Pepper plant is not identical with the Black-Pepper... I conclude that if nowadays the White-Pepper is in great part Black-Pepper without the skin, yet there exists a plant which more distinctly bore its name, and formerly was its chief source." (GUIB., *loc. cit.*, 273, note 2.)

[3] Both contain an essence lighter than water ($C^{10}H^8$), starch, and a crystallizable matter, lighter than water, extracted by PELLETIER (in *Ann. Chim. et Phys.*, xvi. 337), and named *Piperin* ($C^{34}H^{38}N^2O^6$).—See GUIB., *loc. cit.*, 273; *Pharm. Rais.*, ed. 3, 704.

[4] See p. 470, note 6.—NEES & EBERM., *Handb.*, i. 102.—BL., in *Act. Bat.*, xi. 200, fig. 21.—LINDL., *Fl. Med.*, 313.—PEREIRA, *Elem. Mat. Med.*, ed. 4, ii. p. i. 391.—GUIB., *loc. cit.*, 274, fig. 415.—BERG. & SCHMIDT, *Off. Gew.*, ii. t. 29 a.—RÉV., in *Fl. Med. du* xixe *Siècle*, i. 424.

[5] DIETR., *Sp.*, i. 681.—C. DC., *Prodr.*, n. 412.—GUIB., *loc. cit.*, 275.—PEREIRA, *loc. cit.*, 391.—? *P. Cubeba* ROXB., *Fl. Ind.*, i. 159 (nec L.).—*Cubeba canina* MIQ., *Syst.*, 293.

[6] They both contain a green essence ($C^{20}H^{32}$ according to WATTS), an acrid resin, and a crystallizable substance named *cubebin* ($C^{34}H^{17}O^{10}$), by SOUBEIRAN (in *Journ. Pharm.*, xxv. 355).

[7] See p. 470, note 4.

[8] DC., *Prodr.*, n. 478.—*P. longum* RUMPH., *Herb. Amboin.*, v. 433, t. 116, fig. 1.—PISO, *Mant. Arom.*, 182, icon. (nec L.).—BL., *Enum. Pl. Jav.*, i. 70.—*P. Amalago* L., *Spec.*, 41 (excl. syn.).—? *P. Melamiris* HILL, *Dict.*, xxvi. t. 16, fig. 3.—*Chavica officinarum* MIQ., *Syst.*, 256; *Ill.*, 39, t. 34.—GUIB., *loc. cit.*, 276.—ROSENTH., *loc. cit.*, 178.—*C. maritima* MIQ., *Syst.*, 262.—*C. Labillardieri* MIQ., *Syst.*, 263.—*Pharmacum magnum vulgare* RUMPH., *Herb. Amboin.*, 42, t. 26, fig. 1. There is a third Long-Pepper in India; its fruit is used as spice, and its roots are sold under the name of *Pippula-moola*. It is *Chavica Roxburghii* MIQ. (*Syst.*, 239; *Ill.*, t. 30, n. 256), which, as a form with slender fruit, belongs to *P. longum* L., not to *P. officinarum*.

Tropical Asia to envelop the mixture of powdered Areca-nut and lime, is *P. Betle.*[1] In Polynesia the acrid astringent leaves of *P. methysticum*,[2] the *Kava*, *Kawa*, or *Awa*, are chewed, and from them is prepared the intoxicating drink so dear to these benighted nations.[3] *Matico*,[4] long since used by the Peruvians and their neighbours as a sudorific and hæmostat, and in all the cases where we use Cubebs, consists of the leaves of Pipers of the section *Steffensia* (*Artanthe*), especially *P. angustifolium*[5] (fig. 510), and in the next place of *P. aduncum*[6] and *lanceæfolium*;[7] these leaves are elongated acuminate, rugose velvety, reticulated with numerous meshes, convex above, below separated by the rich plexus of prominent veins. Innumerable are the remaining species of this genus prized as remedies where they grow; such as the root of *Piper umbellatum*[8] (*Pariparobo* or *Caapeba*), *P. Hoffmanseggianum*,[9] *marginatum*,[10] *Parthenium*,[11] *unguiculatum*,[12] *eucalyptifolium*,[13] &c., in Brazil;

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[1] See p. 470, note 5.—LINDL., *Fl. Med.*, 312.—GUIB., *loc. cit.*, 277.

[2] See p. 470, note 7.—FORST., *Pl. Esc. Austr.*, 76.—LINDL., *Fl. Med.*, 313.—GUIB., *loc. cit.*, 277.—GOBL., in *Journ. Pharm.*, xxxvii. (1860), 19.

[3] M. CUZENT (in *Rev. Colon.*, sér. 2, xv. 582) terms *kava* a "deadly drink." O'RORKE (in *Rev. Colon.*, sér. 2, July, 1856) says that, barring the way some abuse it, it may be a very useful drink, producing a general feeling of comfort, appetite, and calm sleep. He describes its preparation. It is not alcoholic, or prepared from the fresh root; but the dried root cut into sticks is chewed and insalivated by assistants, and then water being added in a common vessel, it is drunk at once. Its abuse leads to cutaneous affections. *Kava* is, moreover, a sudorific and a powerful adjunct in the treatment of syphilis.

[4] GUIB., *loc. cit.*, 278, fig. 416.—PEREIRA, *op. cit.*, ii. p. i. 395.—BENTL., in *Pharm. Journ.* (1863), 290.—MARCOTTE, *Du Matico* (*Thès. Ecole Pharm. Par.*, 1864).—H. BN., in *Dict. Encycl. des Sc. Méd.*, p. ii. v.

[5] R. & PAV., *Fl. Per. et Chil.*, i. 38, t. 57, fig. a.—C. DC., *Prodr.*, n. 185.—*P. granulosum* R. & PAV., *op. cit.*, i. 38, t. 64.—*P. elongatum* VAHL, *Enum.*, i. 312.—*Steffensia elongata* K., in *Linnæa*, xiii. 637.—GAUDICH., in *Voy. Bonite, Bot.*, 95.—*Artanthe elongata* MIQ., *Syst.*, 434.—GUIB., *op. cit.*, 278, t. 416.—*A. granulosa* MIQ.—*A. cearensis* MIQ.

[6] L., *Spec.*, 41.—C. DC., *Prodr.*, n. 184.—*P. scabrum* LAMK., *Ill.*, 80.—*P. celtidifolium* H. B. K., *Nov. Gen. et Spec.*, i. 50.—*Steffensia adunca* K., in *Linnæa*, xiii. 633.—*Artanthe adunca* MIQ. It is the *P. à fruit crochu* of DESCOURTILS (*Fl. Ant.*, iii. 355, t. 230) and the *Saururus arborescens fructu adunco* of PLUMIER.

[7] H. B. K., *Nov. Gen. et Spec.*, i. 49.—C. DC., *Prodr.*, n. 323.—*Schilleria lanceæfolia* K., in *Linnæa*, xiii. 702.—*Artanthe lanceæfolia* MIQ.

[8] L., *Spec.*, 43.—C. DC., *Prodr.*, n. 383.—*Peperomia umbellata* K., *Syn.*, i. 124.—LINDL., *Fl. Med.*, 314.—MART., *It.*, ii. 93.—*Heckeria umbellata* K., in *Linnæa*, xiii. 569.—*Potomorphe umbellata* MIQ. It is the *Agua xima* of PISO (*Hist.*, 197, ic.) and the *P. à ombelles* of DESCOURTILS (*Fl. Ant.*, i. 177, t. 37).

[9] RŒM. & SCH., *Mant.*, i. 242.—C. DC., *Prodr.*, n. 556.—*P. citrifolium* LINK., *Jahrb.*, i., iii. 63 (nec LAMK.).—ROSENTH., *op. cit.*, 176.

[10] JACQ., *Ic. Rar.*, ii. 2, t. 215.—*P. caudatum* VAHL, *Ecl.*, i. 3.—*P. decumanum* AUBL., *Guyan.*, i. 21 ?—*P. anisatum* H. B. K., *Nov. Gen. et Spec.*, i. 58.—ROSENTH., *op. cit.*, 177.—*Schilleria caudata* K.—*Artanthe caudata* MIQ.

[11] MART., *Syst. Mat. Med. Brasil.*, 100.—*Artanthe Mikaniana* MIQ., *Syst.*, 383 (vulg. *Paribarabea*).

[12] R. & PAV., *Fl. Per. et Chil.*, i. 34, t. 37, fig. 6.—*P. glaucescens* JACQ., *Ecl.*, t. 76.—*P. celtidifolium* DESF., *Cat. Hort. Par.*, ed. 3, 414. *Enckea unguiculata* K.—*E. glaucescens* K.—*E. Amalago* GRISEB. Used chiefly as a diuretic in Brazil, where it is often replaced by *P. reticulatum* L., or *nodulosum* LK.

[13] C. DC., *Prodr.*, n. 43.—*Ottonia eucalyptifolia* K., in *Linnæa*, xiii. 582.

P. arborescens,[1] &c.,[2] in Tropical Asia; *P. capense*[3] in South Africa. Several *Peperomias* are also used as stomachics and tonics, such as *P. trifolia, hispidula, rotundifolia*, &c., in Tropical America, and *P. grandifolia*[4] in Guinea. In the herbaceous species the sapid and aromatic principles become scantier; but their leaves are used as vegetables or infused like tea.[5] The *Chloranthea* are also aromatic and bitter, tonic and stimulant. *Chloranthus officinalis*[6] and *brachystachys*[7] are prized for their roots, which have a persistent pungent scent of camphor, with a rather bitter taste. They are supposed to have the same properties as *Aristolochia Serpentariæ;* the mountaineers often find their stimulating infusion efficacious in fevers accompanied by great muscular weakness and suppression of the action of the skin. This drug, mixed with the bark of *Cedrela Toona*, has cured epidemic intermittent fever, and severe cases of typhus; combined with *Cinnamomum Culilawan* it is used to relieve spasm in children; and with carminatives it is of the greatest service for children in small-pox and chicken-pox. It is, in fine, an inestimable stimulant, according to BLUME. *Ascarina polystachys*,[8] the *Earaihau* of Tahiti, has very persistent aromatic properties.[9] The species of *Hedyosmum* are similarly used in America as aromatic stimulants. *H. Bonplandianum*[10] is an analeptic, useful in fevers, lumbago, headache, &c. Several other species have the properties of *Artanthe*, and share with it the name of *Herba soldado*. In the Antilles *H. nutans*[11] and *arborescens*[12] (figs. 520–525) are popular remedies for spasms or

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1 ROXB., *Fl. Ind.*, i. 161.—*Sirium arborescens tertium* RUMPH., *Herb. Amboin.*, v. t. 28, fig. 1. Its bark is deemed an energetic rubefacient.

2 Among other useful species we may mention *P. dilatatum* RICH., *dichotomum* R. & PAV., *Carpunya* R. & PAV., *attenuatum* MIQ. (*diffusum* VAHL), *sanctum* SCHLECHTL., *geniculatum* SW., *asperifolium* R. & PAV. (*Matico* of Peru), *peltatum* L., *subpeltatum* W., *Churumaya* R. & PAV., *longifolium* R. & PAV., *Waracabouca* C. DC. (*Nhambi* of the Brazilians), *crocatum* R. & PAV., *Jaborandi* VELLOZ (*Serronia Jaborandi* GAUDICH. & GUILLEM.), *Neesianum* C. DC.,&c.—See ROSENTH., *op. cit.*, 176–179, 1102, 1103.

3 L. FIL., *Suppl.*, 90.—C. DC., *Prodr.*, n. 405.—*Coccobryon capense* KL. (ex MIQ., *Syst.*, 343; *Ill.*, 50, t. 61).

4 Use is often made of *P. reniformis* HOOK., *talinifolia* LK., *variegata* R. & PAV., *elliptica* LK. (*Piper mauritianum* SCH.), *cristallina* R. & PAV., *inæqualifolia* R. & PAV., *acuminata* R. & PAV., &c.—See ROSENTH., *op. cit.*, 179, 1103.

5 For instance, *P. pellucida* H. B., *rotundifolia* H. B., &c.

6 BL., *Enum. Pl. Jav.*, iii. 10, t. 1.—SCHNIZL., *Iconogr.*, t. 80, figs. 1–6.—DE SOLMS, *Prodr.*, 474, n. 1.—*C. sumatranus* MIQ.—*C. salicifolius* PRESL.—*C. indicus* WIGHT.—*Cryphæa erecta* HAM.

7 BL., *Fl. Jav.*, iii. 13, 14, t. 2.—LINDL., *Veg. Kingd.*, 519.

8 FORST., *Char. Gen.*, t. 59.—DE SOLMS, *Prodr.*, 478, n. 1.

9 ENDL., *Enchirid.*, 148.

10 H. B. K., *Nov. Gen. et Spec.*, vii. 165, t. 654, 655.—ROSENTH., *op. cit.*, 175.

11 SW., *Fl. Ind. Occ.*, 959.—C. J. DE CORDEM., in *Adansonia*, iii. 305.

12 SW., *loc. cit.*, 961.

indigestion. *H. Granizo* LINDL., has been cited as an antisyphilitic. The *Saurureæ*[1] are also aromatic, though in a less degree. *Houttuynia cordata*[2] (figs. 500–502) is considered an emmenagogue in Eastern Asia. The bruised root of *Saururus cernuus*[3] (figs. 498, 499) is used topically in pleurisy; and the Indians are said to eat[4] that of *S. chinensis*.[5]

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[1] ENDL., *Enchirid.*, 153. — LINDL., *Veg. Kingd.*, 521.—ROSENTH., *op. cit.*, 180.

[2] See p. 468, note 4.

[3] See p. 466, note 1. (*Breast-Weed, Lizard's Tail* of the Americans).

[4] They cultivate *Piper, Peperomia, Chloranthus*, as ornamental plants.

[5] See p. 467, note 2.

GENERA.

I. SAURUREÆ.

1. **Saururus** L.—Flowers hermaphrodite (rarely polygamous) naked; receptacle convex. Stamens 6; 4 lateral in pairs; filaments free, sometimes (*Saururopsis*) articulate; anthers 2-celled; dehiscence longitudinal, introrse lateral or sometimes extrorse. Carpels 3, 4, free; ovary tapering above into short style, sulcate stigmatose inside; ovules 2, inserted at base of ventral angle, sessile descending orthotropous; micropyle superior extrorse. "Berries" 1–4, 1-seeded. Seed orthotropous; albumen copious fleshy; embryo minute subapical inverted, clothed by a second subcarneous amniotic albumen.—Aromatic perennial herbs; rhizome subterranean annual; branches erect; leaves alternate simple petiolate; petiole sheathing at base, produced inside into connate stipules; flowers in short terminal racemes or spikes; bracts alternate 1-flowered, free or connate with elevated axillary flower (*North America, Temperate and Tropical Continental and Insular South-Eastern Asia*). See p. 465.

2. **Houttuynia** Thunb.—Flowers hermaphrodite (nearly of *Saururus*); stamens 3, perigynous free; carpels 3, superposed (more rarely 4), adnate at base to inside of receptacle, and connate high up into a 1-celled ovary; placentas 3 (more rarely 4) parietal, alternating with styles; styles stigmatiferous within; ovules ∞, usually few (of *Saururus*). Fruit baccate; seeds few (of *Saururus*).—A perennial herb (polygonaceous); leaves alternate cordate petiolate; petiole sheathing at base and produced into connate stipules; flowers 1-bracteate, in terminal spikes; a few lower bracts of inflorescence broadly petaloid, coloured, involucrating base of spike (*Continental and Insular South-Eastern Asia*). See p. 467.

3. **Anemiopsis** Hook. & Arn.—Flowers nearly of *Saururus*, hermaphrodite; stamens 5, 6. Germen 1-celled, at base deeply immersed in and adnate to pits of rachis; placentas 3 parietal;

ovules ∞ (of *Saururus*). Styles 3, free, stigmatiferous inside at apex. Baccate fruit and seeds of *Saururus*.—A perennial herb; leaves alternate; flowers spicate terminating 2-phyllous twigs; bracts free, 1-flowered (*New Caledonia*). See p. 468.

4. **Gymnotheca** DCNE.—Flowers hermaphrodite naked; receptacle naked. Stamens 6 (more rarely 7, 8), subepigynous on margin of receptacle, free. Germen adnate inside receptacle, 1-celled; placentas 4 parietal; ovules ∞ (of *Saururus*), 2-seriate on each placenta; styles 4, alternate with placentas, recurved stigmatose a long way down inside. Fruit...?—A perennial herb; aspect and leaves of *Saururus*; flowers spicate (*China*). See p. 468.

II. PIPEREÆ.

5. **Piper** L.—Flowers hermaphrodite or 1-sexual, spicate or racemose. Perianth 0. Stamens 1–10, inserted below gynæceum; filament usually short, free; anther sometimes articulate 2-locular basifixed 2-rimose, 4-valvate when mature. Germen free superior, sessile or stipitate, 1-celled; style short or more or less elongated; apex simple or more frequently 2–4- or plurifid or partite; lobes often reflexed, subequal or unequal, stigmatiferous inside. Ovule subbasilar suberect orthotropous; micropyle superior. Fruit drupaceous, sessile or stipitate, 1-seeded. Seed suberect orthotropous; albumen copious floury; embryo apical inverted, closely coated with a second rather fleshy amniotic albumen.—Trees or shrubs, often climbing; branches sarmentose, knotty-articulate; fibrovascular system double; outer zone tubular; leaves simple petiolate; stipules 2 lateral adnate to continuous margin of sheath and petiole to a variable height, usually high-connate together, persistent or caducous; flowers grouped in scattered simple spikes, or crowded paniculate or spicate at ends of twigs, terminal or (the vegetation being also interrupted at the node) leaf-opposed; bracts 1-flowered; flower sessile or inserted in pits of receptacle, with the margin sometimes produced (and simulating lateral bractlets); bract free or produced into a cupule including the flower (*All Tropical regions*). See p. 469.

6. **Chavica** MIQ.—Flowers and fruits of *Piper;* anthers 2–4, 2-valvate when mature, dehiscing outwards.—Shrubs; aspect, fibro-vascular system, leaves, and inflorescence of *Piper* (*Tropical Asia, Sunda Isles*). See p. 473.

7. **Verhuellia** MIQ.—Flowers nearly of *Piper*; stamens 2, lateral; mature anthers 4-valvate. Free germen and ovule of *Piper;* style short, unequally 4-fid-stigmatose.—Small slender herbs; fibro-vascular system simple scattered; small leaves and inflorescences of *Piper* (*Tropical and Subtropical America, East Africa*). See p. 473.

8. **Peperomia** RUIZ & PAV.—Flowers of *Verhuellia;* anthers (not articulate) 2-valvate extrorse (of *Chavica*). Germen and ovule of *Piper;* style simple.—Herbs or shrubs, often slender; fibro-vascular system of *Verhuellia;* leaves alternate opposite or verticillate; inflorescence of *Piper;* bract free (*All Warm countries*). See p. 473.

III. CHLORANTHEÆ.

9. **Chloranthus** Sw.—Flowers hermaphrodite naked; receptacle cupuliform, produced outside in front below stamens into a scale. Stamens inserted anteriorly on margin of receptacle, either 1; filament thick; anther introrse 2-celled, 4-locellate, longitudinally 2-rimose (*Sarcandra*); or else 3; filaments connate at base into a 3-partite fleshy scale; middle anther 2-celled (sometimes sterile); lateral 2, 1-celled (*Euchloranthus*); connective muticous at apex, or long-loricate beyond cells. Germen adnate at base inside receptacle, 1-celled; style short simple, soon dilated stigmatiferous; ovule 1, inserted below apex of inner wall, subpendulous orthotropous; micropyle inferior. Drupe fleshy or subcarneous, accompanied by adnate base of receptacle; putamen fragile. Seed subpendulous orthotropous; albumen copious; embryo small; radical conical inferior; cotyledons small divaricate.—Shrubs or perennial herbs, aromatic; branches glabrous opposite knotty-articulate; leaves decussate simple; stipules lateral, connate at base to no great height together and with petioles; flowers 1-bracteate in

branching terminal spikes (*North-East and South of Asia, Tropical and Subtropical Continental and Insular*). See p. 475.

10. **Hedyosmum** Sw.—Flowers monœcious or diœcious; males spicate ebracteate, 1-androus; anther sessile 4-locellate; cells parallel, longitudinally rimose; connective shortly apiculate or peltate obtuse above cells. Female flowers: receptacle sacciform; mouth shortly tubular, crowned at apex by 4 usually obtuse teeth (sepals ?). Germen (of *Chloranthus*) adnate inside receptacle; style erect slender, ligulate or subclavate, sometimes irregularly 3-alate at stigmatose apex; ovule and seed of *Chloranthus*. Drupe subcarneous; putamen very hard; embryo minute albuminous; cotyledons superior, scarcely visible.—Aromatic trees and small trees; branches opposite, nodose articulate; leaves opposite simple; stipules only free at apex, below connate together and with petioles into a long amplexicaul ochreiform tubular sheath; flowers terminal; females branching-subcapitate or cymose (*Tropical and Subtropical North and South America*). See p. 477.

11. **Ascarina** Forst.—Flowers nearly of *Chloranthus*, diœcious; male 1-androus, 1-bracteate, laterally 2-bracteolate. Female flowers naked; germen and ovule of *Chloranthus*; style thick, very short subsessile, at apex flat dilated stigmatose; naked drupe and seeds of *Chloranthus*.—Small trees and shrubs, aromatic; habit leaves and inflorescences of *Chloranthus* (*Oceania*). See p. 479.

IV. CERATOPHYLLEÆ.

12. **Ceratophyllum** L.—Flowers monœcious; perianth simple 10–12-fid, or partite; lobes entire or incised, subequal. Male flower: stamens ∞, erect free; filaments very short; anthers basifixed, ovate oblong, at apex 1–3-cuspidate or submuticous; cells 3, extrorse longitudinally rimose. Female flower: germen sessile 1-celled; base muticous or aculeate by 2, 3 descending cusps; style subterminal subulate, stigmatose at apex; ovule 1, orthotropous, subpendulous from below apex of cell; micropyle inferior. Fruit

ally, often a little before anthesis. In the bud the filament is involute and more or less coiled, with the face of the anther applied to the concavity of the corresponding sepal. But on expansion it uncoils by its elasticity[1] directly the anther is free to quit the central body that hooked it down, and becomes suddenly straight, the anther-cells often opening simultaneously to shoot out the pollen.[2] The female flower (figs. 536–538) bears on its convex receptacle

Urtica pilulifera.

FIG. 536. Female flower ($\frac{4}{1}$).

FIG. 537. Diagram of female flower.

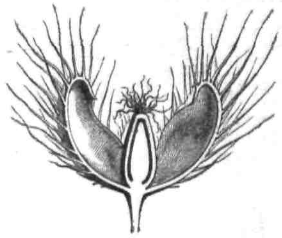

FIG. 538. Long. section of female flower.

four sepals, nearly free or united for a variable distance, imbricate-decussate as in the males, but often with the two pairs dissimilar, the lateral two being usually larger and more concave or carinate than the antero-posterior, and sometimes also dissimilar to one another, rendering the perianth slightly irregular. In the centre of the flower is a unicarpellary gynæceum formed of a free ovary; the terminal style is often very short, or at once divides into a large

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[1] This is due to a peculiar property of its tissue, which gives it a great elasticity. "The filament itself describes a large arc, occupying the space between the lobes of the anther above; it is often transversely notched on its concave side, so as to allow of this forced inflexion. When at last anthesis takes place, and the perianth-leaves scarcely begin to diverge, the filament, by the mere turgescence of its cells, suddenly springs up from the position in which it was hitherto mechanically retained." (WEDD., *Mon.*, 27.) "If on gathering the flowers this phenomenon is at once produced, it must not be supposed that the shock has excited the irritability of the stamen; it has merely freed it from its prison. And though the singular structure of the filament, its transverse folds and vertebra-like articulations, may at first sight appear the indices of a special vital action, it will soon be seen that this arrangement is not the cause of the phenomenon, but the result of the forced flexure during its growth." [H. BN., *Des Mouv. dans les Org. Sex.*, &c. (Par., 1856), 39.] The facts observed in the Pellitories, whose stamens do not always possess these elastic filaments, will enable us to modify this assertion to some extent.

[2] "Spherical, with three umbilici, each surrounded by a halo; outer membrane transparent," in *Urtica urens* and *Parietaria erecta;* and the same with four pores in *Bœhmeria caudata*, according to H. MOHL (in *Ann. Sc. Nat.*, sér. 2, iii. 313). WEDDELL (*Monogr.*, 27) says that the pollen is globular.

number of long papillose hairs, caducous or persistent, which play the part of a stigma. Near the base of the single cell, is inserted on the posterior wall a single ovule, almost erect and orthotropous,[1] with a very short funicle, and the micropyle superior.[2] The fruit is an oblong or oval compressed achene, often warty, surrounded by the persistent perianth. The orthotropal seed contains a fleshy albumen, enclosing in its axis the embryo, whose radicle is superior, cylindro-conoidal, while the cotyledons are rounded or elliptical, subcordate at the base. The Nettles are herbaceous annuals or perennials, rarely frutescent, cosmopolitan, especially frequent in the Temperate regions of both Worlds, with most of their organs usually covered with stinging hairs of peculiar structure.[3] Upwards of seventy species have been described, but their number is now reduced by about one-half.[4] Their branches are often tetragonal, covered with opposite leaves, often dentate, rarely incised lobate, palmiveined, rarely tricostate, more frequently 5–7-ribbed, petiolate, with two lateral stipules, often connate with those of the opposite leaf. The blade is often sprinkled with cystoliths, punctate or more rarely elongated-linear, prominent in the dry leaf.[5] The flowers are in glomerules, grouped along a common axillary axis into capitula (fig. 533), or simple or ramified racemes or spikes, often unilateral, and are diœcious or monœcious; in the latter case the inflorescences may be unisexual or androgynous.

Next to *Urtica* come the two genera *Nanocnide* and *Hesperocnide*. They have the same general organization and straight fruit; but the one has alternate leaves, and the two lateral sepals of the female

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[1] Sometimes a little arcuate, like that of the Planes, especially before maturity, and more convex in front than behind.

[2] It has two coats.

[3] DOUVAL-JOUVE has shown (in *Bull. Soc. Bot. de Fr.*, xiv. 36, t. 1) that the Nettles have three sorts of hairs: (1) Short, invisible to the naked eye, not urticating, with a unicellular cylindrical stem, and a swollen head formed of 2–4 cells. (2) Elongated conical, unicellular, with finely dotted walls. (3) The sting or *stimulus*, urticating simple, long-conical, unicellular, formed of a dilated basilar bulb, a conical stylet continuous with it, and a little inclined tip swollen into a ball. The whole is hollow, filled with an acid, irritant liquid, which gives a burning pain when the tip of the hair breaks off; the skin is inoculated with it by the penetration of the hair. The base of the sting is surrounded by a sheath of prominent cells belonging to the subepidermic parenchyma, and these are supposed to secrete the irritant liquid which then passes into the hair like a reservoir. This hair is merely an elongated epidermic cell. Its wall is hollowed by interstitial vacuoles, forming shining interrupted spiral lines. (See DC., *Fl. Fr.*, iii. 322.—A. JUSS., *Elém.*, 151.—BARHARDT, *De Pilis Pl.*, Bonn. (1849).—WEDD., *Monogr.*, 9.—DUCHTRE, *Elém.*, 99.)

[4] WEDD., *Prodr.*, 39-59, 235[63].

[5] See WEDD., *Sur les Cystolithes... des Urticées* (in *Ann. Sc. Nat.*, sér. 4, ii. 267).

flower always much larger than the other two; the other has opposite leaves, but its female perianth is tubular.

The fruit is oblique in the seven other genera of this series: *Obetia, Fleurya, Laportea, Urera, Scepocarpus, Gyrotænia,* and *Girardinia.* They all have alternate leaves with the stipules axillary, not lateral; they closely resemble one another in floral organization.[1]

II. PROCRIS SERIES.

Procris[2] (figs. 539, 540) has unisexual flowers, monœcious or

Procris Cephalida.

FIG. 539.
Flowering branch ($\frac{1}{2}$).

diœcious. The males are formed nearly as in *Urtica*, but pentamerous, with imbricated sepals, five superposed stamens, and a

[1] See the *Genera*, pp. 517–522.

[2] COMMERS., mss., ex J., *Gen.*, 403.—LAMK., *Ill.*, t. 763.—POIR., *Dict.*, v. 629 (part.); Suppl., iv. 554.—WEDD., *Monogr.*, 333, t. 6, B; *Prodr.*, 191.—*Sciophila* GAUDICH., *Voy. Uran., Bot.*, 493.

little rudimentary globular or obovoid gynæceum. In the female flower the calyx is formed of three four or five sepals, often obovate, cucullate, slightly fleshy. Inside each of these we find, sometimes but not always, a glandular or scaly body, representing a staminode.[1] In the centre of the flower is a gynæceum formed as in the Nettles, of a uniovulate ovary surmounted by a tuft of penicillate hairs, which early disappear. The fruit is an achene or a drupe with a scarcely fleshy mesocarp, surrounded by the now succulent calyx.

Procris Wightiana.

FIG. 540.
Flowering branch ($\frac{2}{3}$).

Within the seed-coats is a fleshy albumen, often thin or even reduced to a membrane; the embryo is turbinate, with a superior conical radicle, shorter than the elliptical cotyledons. *Procris* consists of some half-dozen species,[2] shrubs or undershrubs from tropical Asia, Africa, and Oceania. They have alternate distichous un-

[1] In certain genera of this series they are much more developed, sometimes forming, as in certain *Pileas*, leafy blades nearly as large as the sepals to which they are superposed.

[2] FORST., *Prodr.*, n. 58 (*Dorstenia*); *Char. Gen.*, 53 (*Elatostema*).—PERS., *Syn.*, ii. 556 (*Bœhmeria*). — BL., *Bijdr.*, 508. — MIQ., *Pl. Jungh.*, 23; *Fl. Ind.-Bat.*, i. p. ii. 258.

symmetrical leaves,[1] very unequal, a large leaf usually alternating with another that is very small, bract-like and abortive. All are sprinkled with linear cystoliths. The flowers are collected into little axillary glomerules, grouped in cymes or more rarely capitula in the males. The female glomerules are collected on a common fleshy receptacle, globular or clavate; so that the inflorescence is the same as in several *Artocarpeæ*.

Next to *Procris* come two other allied genera: *Elatostema* has a triphyllous female perianth shorter than the ovary, with a usually involucrate capitulum; *Pellionia* has cymose flowers, with five sepals mucronate below the apex in the females; *Pilea*, *Achudemia*, and *Lecanthus* form a group apart with opposite decussate leaves. The flowers of *Lecanthus* are grouped on a discoidal or concave receptacle; they are cymose or glomerulate in the other two genera. But the females are pentamerous in *Achudemia*, trimerous in *Pilea*; the perianth of the latter is irregular, one of the sepals being larger than the rest and gibbous.

III. BŒHMERIA SERIES.

Bœhmeria[2] (fig. 541) has unisexual flowers, monœcious or diœcious. The males, analogous to those of a Nettle, have a valvate calyx, more or less deeply quadrifid, rarely tri- or quinquefid, with as many superposed stamens inserted below a clavate or subglobular gynæceum, glabrous or heavy at the base. The female perianth is gamophyllous saccate or tubular, contracted towards the mouth, which is incised into from two to four teeth. In this sac, and sometimes adherent to it, is a gynæceum formed as in *Urtica*.[3] The ovary contains a single ovule, orthotropous and suberect or ascending, and tapers above into a usually persistent filiform style, bearing stig-

[1] WEDDELL has noticed that the *Urticaceæ* with unsymmetrical leaves differ from other orders in that, while one half of the blade tapers in a point towards the base, and the other is much larger, rounded or even projecting into an auricle, it is the *former* half, not the latter, that is on the side of the leaf turned towards the parent branch.

[2] JACQ., *Stirp. Amer.*, 216.—J., *Gen.*, 403.—POIR., *Dict.*, Suppl., i. 647.—ENDL., *Gen.*, n. 1884; *Icon.*, t. 86.—WEDD., *Monogr.*, 343, t. 11; *Prodr.*, 195.—*Duretia* GAUDICH., *Voy. Uran.*, *Bot.*, 499.—*Splitgerbera* MIQ., *Comm. Phyt.*, 134.

[3] But it seems to stick to the calyx, not to be inserted in its concavity like a truly inferior ovary in its sacciform receptacle; a slight traction will separate it.

matic papillæ on one side only. The fruit is an achene, included in the persistent calyx, and its crustaceous or nucamentaceous pericarp contains an albuminous seed like that of the Nettles. *Bœhmeria* comprises shrubs and undershrubs, with opposite alternate leaves, homomorphous or dimorphous, symmetrical or unsymmetrical at the base, dentate,[1] sprinkled with inconspicuous punctiform cystoliths, petiolate and accompanied by free or connate stipules, usually

Bœhmeria nivea.

FIG. 541.
Flowering branch ($\frac{1}{3}$).

caducous. The flowers are grouped in glomerules, accompanied by short scarious bracts ; they are axillary, solitary or more frequently collected into ramified spikes or cymes. This genus contains some forty-five species,[2] inhabiting both tropical and still more extra-tropical regions, all over the world.

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[1] Some are more or less deeply bilobate in a species which owes its name to this fact, and has been made the type of a genus *Splitgerbera*.

[2] SW., *Prodr.*, 34.—W., *Spec.*, 340.—H. B. K., *Nov. Gen. et Spec*, ii. 34.—DON, *Prodr. Fl. Nepal.*, 60.—PRESL, *Bot. Bem.*, 110.—ENDL.,

B. squamigera,[1] an Indian species, has been made a distinct genus, *Chamabaina*,[2] because the stigmatiferous apex of the style is subcapitate, not linear; but we can only make it a distinct section on this ground.

The genera *Pouzolsia* and *Memorialis*, both closely allied to the preceding one, differ chiefly in their articulate caducous style, and their fruit, surrounded by a costate or winged persistent calyx. All these genera together form the subseries *Eubœhmerieæ* with the following general characters: a tubular female perianth, free or adherent to the ovary, dry or membranous in the fruit, with two or four apical teeth.

In the related subseries *Sarcochlamydeæ* the female calyx is free, with a lobed or dentate mouth. But it always becomes fleshy and succulent around the fruit. This is the case with the five genera: *Cypholophus*, *Touchardia*, *Laurea*, *Sarcochlamys*, and *Poikilospermum*.

A third subseries *Villebrunieæ* contains the three genera *Pipturus*, *Villebrunea*, and *Debregeasia*, wherein the female calyx is adnate to the ovary, with a very small limb, dentate or subentire.

In *Maouticæ*, the fourth subseries, the female calyx is rudimentary or absent. It contains the four genera, *Leucosyke*, *Maoutia*, *Myriocarpa*, and *Phenax*.

IV. PELLITORY SERIES.

The Pellitories[3] have polygamous flowers. Those of our commonest species, the Wall Pellitory (figs. 542–546), are partly hermaphrodite. Their receptacle is convex, bearing four valvate sepals,[4] free or coherent below to a variable distance, lined right at the bottom by a variable quantity of hairs. Four stamens are super-

Prodr. Fl. Norfolk., 38; *Iconogr.*, t. 86.—HOOK. & ARN., in *Beech. Voy.*, *Bot.*, 214, 271.—BENTH., *Niger Fl.*, 519.—ZOLL., *Verz.*, 100, 101, 105.—WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 199.—BL., *Mus. Lugd.-Bat.*, ii. 201, 210, 211, 226.

[1] WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 203.

[2] WIGHT, *Icon.*, vi. t. 1981.—WEDD., *Monogr.*, 387, t. 12, B; *Prodr.*, 218.

[3] *Parietaria* T., *Inst.*, t. 289.—L., *Gen.*, n. 1152 (part.).—ADANS., *Fam. des Pl.*, ii. 261.—J., *Gen.*, 404.—POIR., *Dict.*, v. 13; Suppl., iv. 300.—LAMK., *Ill.*, t. 853.—ENDL., *Gen.*, n. 1885 (part.).—PAYER, *Organog.*, 276, t. 60.—WEDD., *Monogr.*, 503, t. 17; *Prodr.*, 235 [41].—*Thaumuria* GAUDICH., *Voy. Uran.*, *Bot.*, 501.—*Freirea* GAUDICH., *loc. cit.*, 502 (incl.: *Gesnouinia* GAUDICH., *Helxine* REQ.).

[4] According to PAYER there are (probably) two anterior, two posterior.

posed; each has a free filament of variable form[1] inserted under the ovary, and an introrse two-celled anther of longitudinal dehiscence. The gynæceum, inserted on the conical apex of the receptacle, consists of a one-celled uniovulate ovary, analogous to that of the Nettles, surmounted by a slender style, articulated at the base and

Parietaria officinalis.

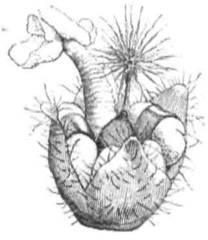

FIG. 543.
Hermaphrodite flower ($\frac{6}{1}$).

FIG. 542.
Flowering branch.

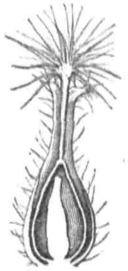

FIG. 544.
Long. sect. of female flower ($\frac{8}{1}$).

caducous, with a stigmatiferous head, whose unilateral investment with long papillose hairs gives it the look of a bottle-brush (figs. 543, 544). The female flowers possess only a gynæceum, closely surrounded by the tubular gamosepalous calyx. The males have a shorter calyx, with the leaves free or nearly so, lined with hairs, close to the base of a rudimentary gynæceum. Against this are applied the anthers, while their filaments are strongly bent in the bud; on anthesis they become straight by elasticity. The fruit (figs. 545, 546) is a straight somewhat compressed achene, smooth and shiny,[2] enveloped in the persistent calyx. The orthotropous seed, formed nearly as in the Nettles, has a cylindro-conoidal embryo, of nearly the same length as the cotyledons, which are

[1] When the anthers are retained at the centre of the male bud, either by the rudimentary gynæceum or by the hairs at the bottom of the perianth, the filament thickens during this incurvation, and then there form on its inner face the superposed transverse ridges alternating with grooves. To the turgescence of these bars is due the elastic rising of the filament. But when the filaments are shorter, not incurved, but erect and straight, which is the case in some flowers that are female or more or less completely hermaphrodite, no transverse band is developed on the inner face; it remains smooth like the outer one, and no phenomenon of elasticity takes place.

[2] Green, more or less dark in colour, according to the age.

elliptical or ovate-oblong. Wall Pellitory is a perennial herb covered with hooked hairs, possessing alternate entire tricostate leaves, sprinkled with punctate cystoliths, petiolate, with very small stipules or none. The axillary flowers are usually grouped five together into a little cyme on either side of a little axillary twig. The central flower is female; the four others, male or hermaphrodite, are paired on either side, axillary to a bract, accompanied by two lateral bractlets, forming with it a sort of involucre.

Parietaria officinalis.

FIG. 545. Fruit. ($\frac{5}{1}$).

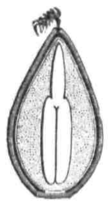

FIG. 546. Long. sect. of fruit.

Other species are distinguished by their frutescent or annual stems, their unsymmetrical cymes, uniparous by abortion, their leaves three-ribbed at the base. In *P. arborea*[1] made into the distinct genus *Gesnouinia*,[2] the stigma is linear, not aspergilliform, and the cymes are trifloral, with the central flower female: from these characters we make it a separate section. So we regard *P. Soleirolii*,[3] a species from Corsica and Sardinia, which has been made into the genus *Helxine*;[4] its inflorescence is reduced yet more, containing only one flower, male or female, in the axillary involucre.

Thus constituted, *Parietaria* comprises a dozen species[5] from the cold and temperate regions of both Worlds. Next to it come two closely allied genera, *Hemistylis* and *Rousselia*, representing the same type, very slightly modified in America.

V. FORSKOHLEA SERIES.

Forskohlea[6] (figs. 547–551) has monœcious flowers, reduced to a

[1] LHÉR., in *Roz. Journ.*, xxxiii. 55.

[2] GAUDICH., *Voy. Uran., Bot.*, 502.—WEDD., *Monogr.*, 521, t. 18, B; *Prodr.*, 235[49].

[3] SPRENG., *Syst.*, iv. p. ii. 218.—GREN. & GODR., *Fl. de Fr.*, iii. 110.—*P. repens* SOLEIR. (ex MUT., *Fl. Fr.*, iii. 172).

[4] REQ., in *Ann. Sc. Nat.*, sér. 1, v. 384.—WEDD., *Monogr.*, 529, t. 18, A; *Prodr.*, 235[51].—*Soleirola* GAUDICH., *Voy. Uran., Bot.*, 504; *Voy. Bon., Bot.*, t. 114, B.

[5] L., *Spec.*, 1492.—FORST., *Prodr.*, n. 387.—DEL., *Egypt.*, 137, t. 50.—DUR., in *Duchtr. Rev. Bot.*, ii. 427.—BL., *Mus. Lugd.-Bat.*, ii. 245.—WEBB, *Phyt. Canar.*, iii. 264.—WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 207 (*Gesnouinia*).—DUB., *Bot. Gall.*, i. 418 (*Helxine*).—VIV., *App. Fl. Cors. Prodr.*, 7 (*Parietaria*).—LEDEB., *Fl. Ross.*, iii. 639.

[6] *Mantiss.*, 11, n. 1262.—ENDL., *Gen.*, n.

single stamen or carpel. The stamen (figs. 547–549), resembling that of the Nettles, is accompanied on the outer side by a gamo-

Forskohlea tenacissima.

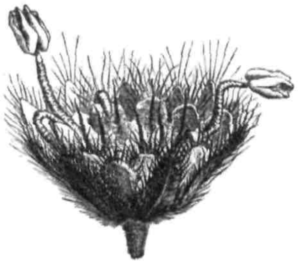

FIG. 547.
Inflorescence ($\frac{5}{1}$).

FIG. 548.
Long. sect. of inflorescence.

sepalous sort of bract, obtusely tridentate at the apex, and perhaps representing a triphyllous perianth, cleft right down on the inside. There is no rudimentary gynæceum. In the female flower

Forskohlea tenacissima.

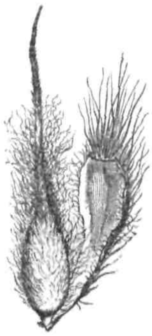

FIG. 550.
Female flower ($\frac{8}{1}$).

FIG. 549.
Male flower ($\frac{6}{1}$).

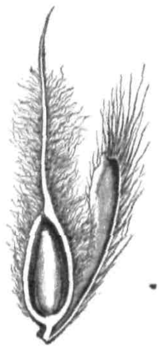

FIG. 551.
Long. sect. of female flower.

(figs. 550, 551) there is a perianth (?) analogous to that of the male; and inside this a uniovulate ovary, like that of the Nettles, tapering into a long slender style, covered with hairs.[1] The fruit is

1887.—WEDD., *Monogr.*, 532, t. 19, B; *Prodr.*, 235[54].—*Forskalea* J., *Gen.*, 403.—GÆRTN., *Fruct.*, i. 332, t. 68.—LAMK., *Dict.*, ii. 521; *Ill.*, t. 388.—*Caidbeja* FORSK., *Fl. Æg.-Arab.*, 82.

[1] The ovary when young looks just like a little oval leaf, folded into a cornet with a very oblique mouth, and tapers to an apex in front, where the style is to be; while the ovule takes origin behind at the bottom of the gaping orifice.

an achene; within the seed-coats is a fleshy albumen surrounding an embryo with rounded cotyledons, more or less cordate at the base, as long as the superior conical radicle or longer. *Forskohlea* comprises herbs or undershrubs, from the Mediterranean, North and South Africa, and West Asia. Their leaves are alternate, accompanied by lateral stipules, and covered with hooked hairs; the flowers are surrounded by a little axillary common involucre, formed of from two to six foliaceous bracts, free, but covered inside with a quantity of wool that often holds them together; they contain one or more female flowers, usually surrounded by a certain number of males (figs. 547, 548). Five species of this genus have been described.[1]

Of *Droguetia*,[2] only distinguishable with difficulty from *Forskohlea* by a gamophyllous perianth, we make a mere section, comprising four species, Asiatic and African.[3]

In the little group *Australineæ* the involucre disappears. The flowers are monandrous and of similar organization in *Australina* and *Didymodoxa*, diandrous in *Distemon*.

The Nettles, with some allies, entered into LINNÆUS' *Scabrideæ*;[4] ADANSON[5] placed them in his family *Châtaigniers* (Chestnut-trees). In the time of A. L. DE JUSSIEU[6] the *Urticeæ* were held to comprise not merely the Nettles and similar genera, but also *Artocarpeæ*, *Moreæ*, *Cannabineæ*, *Piperaceæ*, and even *Cynocrambeæ*.[7] R. BROWN,[8] in 1818, established *Artocarpeæ*, *Celtideæ*, &c., as distinct orders, on the one hand, and *Urticeæ* proper on the other. ENDLICHER[9] only changed the name to *Urticaceæ*. Of the order thus restricted

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[1] L. FIL., *Suppl.*, 245.—RETZ., *Obs.*, fasc. iii. 31.—DESF., *Cat. Hort. Par.*, ed. 3, 347.—WEBB., *Spicil. Gorgon.*, 179; *Phyt. Canar.*, iii. 266.

[2] GAUDICH., *Voy. Uran., Bot.*, 505; *Voy. Bon., Bot.*, t. 87.—ENDL., *Gen.*, 285.—WEDD., *Monogr.*, 538, t. 19, A; *Prodr.*, 235 [57].—*Didymogyne* WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 35 (part.).

[3] PERS., *Enchir.*, ii. 554 (*Urtica*).—A. RICH., *Fl. Abyss. Tent.*, ii. 259 (*Pouzolzia*).—WIGHT, *Icon.*, t. 1982 (*Forskohlea*).—BL., *Mus. Lugd.-Bat.*, ii. 201 (*Bœhmeria*).

[4] *Ord. Nat.* (1737), 593.

[5] *Fam. des Pl.*, ii. (1763), 376.

[6] *Gen.* (1789), 400.

[7] He even included the Monimiads *Ambora* and *Hedycaria*, mistaking their flower for an inflorescence; the Haloragad *Gunnera*; and the Paronchiad *Pteranthus*.

[8] *Obs. Pl. Cong.*, 35; *Misc. Works* (ed. BENN.), i. 137.

[9] *Prodr. Fl. Norfolk.*, 37; *Gen.*, 282, ord. 94 (1836).—LINDL., *Veg. Kingd.*, 260, ord. 84.

LINNÆUS knew only the three genera *Urtica*, *Parietaria*, and *Forskohlea*. JUSSIEU in 1789 published *Procris* of COMMERSON; the two FORSTERS founded *Elatostema* in 1776, and JACQUIN *Bœhmeria* in 1763. The other genera are comparatively recent. In 1821 LINDLEY made the genus *Pilea* for a number of species, and WALLICH made known *Memorialis* of HAMILTON. Another Indian genus *Chamabaina*, is due to WIGHT. GAUDICHAUD, from 1826 to 1829, in the accounts of the botany of the voyages of the *Bonite* and *Uranie*, published the largest number of our modern genera. Of those at present retained there are fifteen: *Australina*, *Debregeasia*, *Droguetia*, *Fleurya*, *Girardinia*, *Laportea*, *Neraudia*, *Obetia*, *Pellionia*, *Pouzolsia*, *Rousselia*, *Sarcochlamys*, *Touchardia*, *Urera*, and *Villebrunea*. Yet more recently appeared *Myriocarpa* and *Hemistylis* of BENTHAM, *Didymodoxa* of E. MEYER, *Leucosyke* of ZOLLINGER. H. A. WEDDELL, in the remarkable memoirs we shall refer to below, established the seven genera *Cypholophus*, *Distemon*, *Lecanthus*, *Maoutia*, *Phenax*, *Pipturus*, and *Scepocarpus*. BLUME, whose researches on this group are of later date,[1] distinguished two other generic types, *Achudemia* and *Nanocnide*. To these thirty-six genera have been added *Gyrotænia* by GRISEBACH in 1860, *Poikilospermum* of ZIPPEL by MIQUEL in 1863, and *Hesperocnide* by TORREY & A. GRAY in 1857.

WEDDELL, who has recently given most attention to this so natural an order, and studied it with extreme care,[2] divides it into five tribes, characterized as follows:

I. UREREÆ.—Plants with stinging (urticating) hairs, leaves opposite decussate, or alternate and inserted in a spiral. Female perianth 4-partite or 4-lobate, rarely 2-partite or 2-lobate, or tubular, always free (3 genera).

II. PROCRIDEÆ.—Unarmed plants; leaves opposite or (by abortion) alternate and often distichous. Female perianth 3-partite,

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[1] WEDDELL has shown (*Monogr.*, 48, 54, 90, 588) that BLUME'S works on the *Urticaceæ*, published in vol. ii. of the *Museum Botanicum Lugduno-Batavum*, though dated 1842, only appeared in 1856.

[2] In several remarkable works, especially his *Monographie des Urticées* (in *Arch. Mus.*, ix. 49) and the *Urticaceæ* of DE CANDOLLE'S *Prodromus* (xvi. sect. i. 32–235[64]). These excellent publications date from 1856 and 1869 respectively. We have used them as a guide in the study of this order, and adopted as far as possible the conclusions of their author. BLUME is the last author who has made great investigations into this family; we have mentioned these in note 1, and that they were really posterior to WEDDELL'S.

rarely 5-partite, free, often accompanied by oppositipetalous staminodes. Stigma penicillate (6 genera).

III. BŒHMERIEÆ.—Unarmed plants; leaves opposite or alternate. Female perianth free or adnate, adherent to the ovary, sometimes (very frequently) tubular, sometimes very short or absent (16 genera[1]).

IV. PARIETARIEÆ.—Unarmed plants; leaves always alternate and quite entire. Flowers diclinous or polygamous. Inflorescences (at least the females) possessing two or more herbaceous bracts. Female perianth tubular free (5 genera[2]).

V. FORSKOHLEÆ.—Plants unarmed or sometimes covered with indurated hairs; leaves alternate or opposite. Flowers diclinous, often involucrate. Female perianth tubular or absent (5 genera).

Here we see the most variable characters that allow us to divide the order into tribes or series. The other variable characters of less importance, on which the genera and smaller divisions are founded, are as follows. The stem may be woody or herbaceous, erect or rooting. The leaves may be opposite or alternate, symmetrical or unsymmetrical at the base; and we often find inequality between the two opposite leaves or two adjacent alternate leaves, the smaller sometimes aborting completely. The venation is pinnate; or the blade may be tricostate or triplicostate[3] at the base. The leaves, moreover, like the other organs, are glabrous or covered with hairs, which, again, may be of three kinds: simple non-urticating; simple and urticating, glandular at the base; capitate pluricellular, non-urticating.[4] Cystoliths[5] are also usually present in the blade, presenting pretty constant variations in arrangement and form; the latter may be rounded, oblong, fusiform, linear, or more rarely stellate. The stipules are sometimes lateral, sometimes axillary, cauline or petiolar, free or united in pairs for a variable distance, caducous or persistent. The floral cymes are simple or ramified, solitary or grouped into simple or compound racemes or spikes, symmetrical or unilateral. The axis of the general inflorescence is

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[1] Reduced by us to 15 by restoring *Chamabaina* (*B. squamigera*) to *Bœhmeria*.

[2] Reduced to 3, by uniting *Gesnouinia* and *Helxine* to *Parietaria*.

[3] "In a 3-*costate* leaf (*folium* 3-*nervium*) the basilar ribs spring from the midrib at the very insertion of the petiole; in a 3-*plicostate* leaf (*folium* 3-*plinervium*) they are given off a little above the insertion." (WEDD., *Prodr.*, 34.)

[4] See p. 499, note 3.

[5] WEDD., in *Ann. Sc. Nat.*, sér. 4, ii. 267; *Monogr.*, 10.

sometimes cylindrical, filiform, sometimes dilated into a membranous cladode,[1] or a plate, cup, or pyriform sac, like the common receptacle of a fig. The flowers are sessile, or pedicellate; the pedicel has often one or even two articulations, especially in the males. The inflorescence is sometimes naked, sometimes possessing bracts, small and distant, or leafy and involucrant; free or cohering for a variable distance, they may form a single pair or verticil, or belong to numerous successive generations, corresponding to all the axes of a contracted dichotomous cyme. The type of the flower is variable; the number of sepals, when present, is from one to five, equal or dissimilar, free or coherent, valvate or imbricate. In the fruit they disappear, or persist, dry and membranous, or thickened and fleshy. The rudimentary gynæceum present in the male flower varies in form with the genus. In female flowers there may be rudimentary stamens below the gynæceum, but they are usually absent. The form of the parts of the gynæceum also varies greatly, according to the genus. The ovary, like the fruit, may be symmetrical or unsymmetrical, with the style at the geometrical apex or some way off it. The middle layer of the pericarp is more or less fleshy; its surface is smooth granular or tuberculate. The albumen varies greatly in quantity, and may even be reduced to a simple membrane. The form and relative dimensions of the radicle and cotyledons are also subject to numerous variations.

The constant or nearly constant characters of the order are as follows: simple stipulate[2] leaves, apetalous diclinous flowers[3] grouped in definite cymes,[4] an isostemonous or meiostemonous androceum,[5] with a rudimentary pistil in the male flowers, and in the females a unicarpellary gynæceum, with a one-celled ovary; a solitary, ascending or suberect orthotropous or suborthotropous ovule, with its micropyle; and finally an indehiscent fruit.

The *Urticaceæ* also present several histological characters that are constant or very general. WEDDELL[6] has shown that the stem of most

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[1] Especially in *Urtica membranacea* (POIR., *Dict.*, iv. 638), where the axis seems to be fasciate.

[2] In *Parietaria* alone are the stipules rudimentary or absent.

[3] Usually unisexual, but polygamous in *Parietaria*.

[4] GUILLARD (in *Presse Sc. des Deux Mondes*, ii. [1861], 319), considering the inflorescence of the plant as a whole, says that in *Urticeæ* it forms a repeated polydiopsidal cyme, repeated indefinitely on axillary branches of all ages; or an indefinite, indefinitely repeated, sessile axillary Cymobotrya.

[5] Of never more than one verticil.

[6] *Monogr.*, 7.

of them is not noticeably distinct from that of Dicotyledons generally, but in several species certain tissues are exceptionally modified, especially in the liber and woody system. "In the tribe *Urereæ*, for instance, which gives us an exceedingly interesting study in this respect, the medullary rays are much prolonged vertically, without any consequent change in the form of their cells, and are often seen to constitute real septa between the fibrovascular bundles."[1] The vessels are very variable in calibre, most voluminous where the wood is soft. The dots too, rounded or more or less transversely elongated, are larger as the wood is less compact. Some Nettles have been said to lack medullary rays.[2] GUILLARD[3] thinks the woody fibres remarkable "in the thinness of the walls, retained even in the adult branches, in the regularity of their prismatic quadrangular form, and in their equality in thickness, about $\frac{1}{100}$ of a millimetre." The same author notices that the tracheæ of the medullary sheath are sometimes few and very large, approximated into bundles, sometimes, as in certain species of *Urtica* and *Pilea*, "grouped in no apparent order." He distinguishes the medullary rays as "extraordinary for the height of their cells." But all authors[4] agree in recognising that it is especially in the organization of the liber that the *Urticaceæ* are distinguished from the rest of Dicotyledons by a striking character. In fact, the cortical, singly very long and very fine, adhere to one another end to end, though not fused; this renders them textile and of industrial value. Moreover, it is easy enough to make out that the fibres are so arranged inside the bark as to form concentric zones, and that each fibre is separated from its collateral neighbours by one or more rows of cells; the fibres of the outermost layer are almost scattered through the cellular tissue of the middle layer of the bark."[5] The suberous layer is generally ill developed.[6] The wood may present peculiar features in some trees that grow to a

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[1] "I found this arrangement in a woody *Pilea*; it, no doubt, is also present in *Elatostema*." (WEDD., *op. cit.*, 8.)

[2] CHATIN, *Anat. Comp. des Vég.*, livr. iii. 9 (not.).

[3] *Loc. cit.*, 314. The author gives in the same work (p. 312) a table of the general structure of the stem, and represents that of *Parietaria* (*Gesnouinia*) *arborea* (figs. 15, 17); he also describes and figures the structure of the leaves, the starch-granules, crystals, raphides, &c.

[4] WEDD., in *Ann. Sc. Nat.*, sér. 4, vii. 309.—GUILL., *loc. cit.*, 312, 313.—REISSEK, in *Denk. d. K. Akad. Wiss. Wien*, vi.—OLIV., *Stem in Dicot.*, 33 (in *Nat. Hist. Rev.*, iii. 252).

[5] In fine, the liber closely resembles that of Hemp, and has nearly the same properties.

[6] "The suberous layer has usually from four to eight concentric zones. This is as many, or more, than we find in most other orders." (GUILL., *loc. cit.*, 315.)

great height; for instance, in *Laportea gigas*,[1] which may attain one hundred feet, the dots of the woody fibres and vessels are surrounded by a concave areola, which, with that of the neighbouring fibre, forms a lenticular chamber, comparable to that found in many trees of various orders.[2]

The affinities[3] of the order *Urticaceæ* are numerous. We have mentioned[4] its close ties with *Pipereæ*, and shown how it is chiefly distinguished by the organization of the fruit, seed, and embryo; it also differs in the manner of inflorescence, and its perianth and properties. All the secondary groups formerly united with this into one immense common order, and now separated into *Cannabineæ*, *Moreæ*, *Artocarpeæ*, *Ulmaceæ*, *Celtideæ*, are, no doubt, most nearly related to it. But they are constantly separated, generally speaking by the presence of two carpellary leaves, united into a two-celled ovary, with one cell sometimes sterile, often distinct towards the top of the style, and connected below by an axile placentary column, which is inserted on either side an ovule more or less decidedly anatropous and descending. It is by an analogous character that *Urticaceæ* are far removed from many *Polygonaceæ*, *Salsolaceæ*, &c., with which they have been compared.[5] In all these plants the basilar or free central placenta bears more than one carpellary leaf. But in *Urticaceæ* the gynæceum is unicarpellary, as in *Ceratophylleæ* and *Pipereæ*, to which botanists have rightly noticed their relations,[6] and as in *Nyctagineæ*, distinguished from this order chiefly by their often petaloid perianth and their anatropous ovule. The latter character also extends to several unicarpellary *Phytolaccaceæ*. WEDDELL has chiefly compared the present order to *Tiliaceæ* and *Malvaceæ*, considering it especially as a reduced type of the former,[7] like *Buettnerieæ* may be said to have a reduced type in *Euphorbiaceæ*. The last-named order shows in certain cases such close analogies in habit, foliage, and

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1 WEDD., *Monogr.*, 129, t. 3, 4; *Prodr.*, 82, n. 11.—*Urtica gigas* A. CUNN., mss.—*Urera excelsa* WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 178.—*U. rotundifolia* WEDD., *loc. cit.*

2 WEDD., *Monogr.*, 131, t. 4, figs. 1–9. The bark contains, besides liber fibres, large oblong cells filled with acicular or prismatic raphides of oxalate of lime (fig. 2). GUILLARD (*loc. cit.*, 314) presumes that this is exceptional in the order.

3 WEDD., *Monogr.*, 32.

4 See p. 486.

5 LINDL., *Veg. Kingd.*, 261, 262.

6 LINDL., *loc. cit.*, 264.

7 See, for the development of this proposition, his *Monographie*, 35–41.

of them is not noticeably distinct from that of Dicotyledons generally, but in several species certain tissues are exceptionally modified, especially in the liber and woody system. "In the tribe *Urereæ*, for instance, which gives us an exceedingly interesting study in this respect, the medullary rays are much prolonged vertically, without any consequent change in the form of their cells, and are often seen to constitute real septa between the fibrovascular bundles."[1] The vessels are very variable in calibre, most voluminous where the wood is soft. The dots too, rounded or more or less transversely elongated, are larger as the wood is less compact. Some Nettles have been said to lack medullary rays.[2] GUILLARD[3] thinks the woody fibres remarkable "in the thinness of the walls, retained even in the adult branches, in the regularity of their prismatic quadrangular form, and in their equality in thickness, about $\frac{1}{100}$ of a millimetre." The same author notices that the tracheæ of the medullary sheath are sometimes few and very large, approximated into bundles, sometimes, as in certain species of *Urtica* and *Pilea*, "grouped in no apparent order." He distinguishes the medullary rays as "extraordinary for the height of their cells." But all authors[4] agree in recognising that it is especially in the organization of the liber that the *Urticaceæ* are distinguished from the rest of Dicotyledons by a striking character.[5] In fact, the cortical, singly very long and very fine, adhere to one another end to end, though not fused; this renders them textile and of industrial value. Moreover, it is easy enough to make out that the fibres are so arranged inside the bark as to form concentric zones, and that each fibre is separated from its collateral neighbours by one or more rows of cells; the fibres of the outermost layer are almost scattered through the cellular tissue of the middle layer of the bark."[5] The suberous layer is generally ill developed.[6] The wood may present peculiar features in some trees that grow to a

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4 WEDD., in *Ann. Sc. Nat.*, sér. 4, vii. 309.—GUILL., *loc. cit.*, 312, 313.—REISSEK, in *Denk. d. K. Akad. Wiss. Wien*, vi.—OLIV., *Stem in Dicot.*, 33 (in *Nat. Hist. Rev.*, iii. 252).

5 In fine, the liber closely resembles that of Hemp, and has nearly the same properties.

6 "The suberous layer has usually from four to eight concentric zones. This is as many, or more, than we find in most other orders." (GUILL., *loc. cit.*, 315.)

great height; for instance, in *Laportea gigas*,[1] which may attain one hundred feet, the dots of the woody fibres and vessels are surrounded by a concave areola, which, with that of the neighbouring fibre, forms a lenticular chamber, comparable to that found in many trees of various orders.[2]

The affinities[3] of the order *Urticaceæ* are numerous. We have mentioned[4] its close ties with *Pipereæ*, and shown how it is chiefly distinguished by the organization of the fruit, seed, and embryo; it also differs in the manner of inflorescence, and its perianth and properties. All the secondary groups formerly united with this into one immense common order, and now separated into *Cannabineæ*, *Moreæ*, *Artocarpeæ*, *Ulmaceæ*, *Celtideæ*, are, no doubt, most nearly related to it. But they are constantly separated, generally speaking by the presence of two carpellary leaves, united into a two-celled ovary, with one cell sometimes sterile, often distinct towards the top of the style, and connected below by an axile placentary column, which is inserted on either side an ovule more or less decidedly anatropous and descending. It is by an analogous character that *Urticaceæ* are far removed from many *Polygonaceæ*, *Salsolaceæ*, &c., with which they have been compared.[5] In all these plants the basilar or free central placenta bears more than one carpellary leaf. But in *Urticaceæ* the gynæceum is unicarpellary, as in *Ceratophylleæ* and *Pipereæ*, to which botanists have rightly noticed their relations,[6] and as in *Nyctagineæ*, distinguished from this order chiefly by their often petaloid perianth and their anatropous ovule. The latter character also extends to several unicarpellary *Phytolaccaceæ*. WEDDELL has chiefly compared the present order to *Tiliaceæ* and *Malvaceæ*, considering it especially as a reduced type of the former,[7] like *Buettnerieæ* may be said to have a reduced type in *Euphorbiaceæ*. The last-named order shows in certain cases such close analogies in habit, foliage, and

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[1] WEDD., *Monogr.*, 129, t. 3, 4; *Prodr.*, 82, n. 11.—*Urtica gigas* A. CUNN., mss.—*Urera excelsa* WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 178.—*U. rotundifolia* WEDD., *loc. cit.*

[2] WEDD., *Monogr.*, 131, t. 4, figs. 1–9. The bark contains, besides liber fibres, large oblong cells filled with acicular or prismatic raphides of oxalate of lime (fig. 2). GUILLARD (*loc. cit.*, 314) presumes that this is exceptional in the order.

[3] WEDD, *Monogr.*, 32.

[4] See p. 486.

[5] LINDL., *Veg. Kingd.*, 261, 262.

[6] LINDL., *loc. cit.*, 264.

[7] See, for the development of this proposition, his *Monographie*, 35–41.

inflorescence, that it has been rightly affirmed that there is scarcely a collection in which they are not frequently confounded. True *Euphorbiaceæ* may be often distinguished by the gynæceum formed of two, three, or more carpels. But when these are solitary, as is the case in *Macaranga*, *Eremocarpus*, *Antidesma*, &c., with the flowers moreover unisexual, and sometimes even achlamydeous, the only remaining essential character lies in the more or less complete anatropy of the descending ovules.

The geographical distribution of the thirty-nine genera (comprising some five hundred species) now admitted in this order present some interesting features. According to WEDDELL,[1] "the New World contains about a third; Europe and Malaysia another third; Oceania and Africa divide equally nine-tenths of the remaining third; while Europe only claims a dozen species." Among these last are five or six species of Nettles and Pellitories that multiply about our dwellings. Some species of *Urtica*, such as *U. dioica* and *urens*, and *Parietaria*, such as *P. debilis*, are spread over the temperate and subtropical regions of the five quarters of the globe. *U. urens* extends into the Arctic regions, nearly as much a cosmopolitan as *P. debilis*; indeed, it is that one of those species that accompany man everywhere in his migrations. Near the Equator, where the *Urticaceæ* are the worst weeds, we find a curiously unequal distribution between the continents and islands. In the Tropical archipelagos the percentage of species in the Phanerogamic flora is 5 to 6; in the neighbouring continents it is only 2.

The properties[2] of the *Urticaceæ* are unimportant; were it not for the stinging hairs, which make some species prized as *urticating*[3]

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[1] *Monogr.*, 41, 45. This work contains opposite page 552 a detailed table of the geographical distribution, with the total number of species representing each genus in the various parts of each hemisphere. According to this summary, out of 476 species, the Old World contains 289, the New 187.

[2] ENDL., *Enchirid.*, 170.—LIND., *Veg. Kingd.*, 261; *Fl. Med.*, 295.—GUIB., *Drog. Simpl.*, ed. 6, ii. 328.—ROSENTH., *Syn. Pl. Diaphor.*, 199, 1108.

[3] Therapeutical irritation is sometimes practised in Europe with *U. dioica* L. or *urens* L., more rarely with *U. pilulifera* L. It causes a transitory cutaneous irritation, sometimes very acute, due to inoculation with the acid liquid contained in the stings (see p. 498, note 3).

counter-irritants, and which make the contact of certain tropical species[1] so dangerous, their use in medicine would be very slight; for there is no great foundation for medical virtues[2] in the calcareous salts contained in the Nettles,[3] or the nitrate of potash in Wall-Pellitory[4] (figs. 542–546). Tasteless, and with scarcely any active properties, the leaves or young shoots of several species of *Urtica*,[5] *Pilea*,[6] *Pouzolsia*,[7] *Elatostema*,[8] &c., are only used in our country-districts and several tropical countries as watery vegetables, as greens and topical emollients, like Lettuce, Purslane, or Spinach. But the

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[1] These species, formerly regarded as Nettles, generally belong to *Laportea*. *L. crenulata* GAUDICH. (*Voy. Uran.*, *Bot.*, 496;—WEDD., *Monogr.*, 133, n. 8; *Prodr.*, 85, n. 16;—*L. gigantea* GAUDICH., *loc. cit.*;—*L. latifolia* GAUDICH.;—*Urtica javaensis* J.;—*U. gigantea* POIR., *Dict.*, Suppl., iv. 224;—*U. crenulata* ROXB., *Fl. Ind.*, iii. 591;—*U. sinuata* BL.;—*U. Churta* HAM.;—*Urera javaensis* GAUDICH.;—*U. gigantea* GAUDICH.;—*U. crenulata* WEDD.;—*U. Commersoniana* WEDD.;—*Dendrocnide crenulata* MIQ., *Pl. Jungh.*, 31) is famous from LESCHENAULT's account of his being stung in the Calcutta Botanical Gardens by this plant, the *Mealum-ma*, of which the Hindoos are very much afraid. Though only three fingers were pricked, severe inflammatory and tetanic symptoms came on, with intense pain, and only disappeared after eight days. The sting of this plant has been said to determine violent fever, and even death. *L. decumana* WEDD. (*Monogr.*, 127, n. 4;—*Urtica decumana* RUMPH., *Herb. Amboin.*, vi. 471, t. 20, fig. 1;—WIGHT, *Icon.*, ii. 689), is the *Dan gattal besaer* of the Malays, much used by them for systematic urtication. The part rubbed by the leaves reddens, and often blisters, unless the epidermis is too thick, as on the sole of the foot. The pain is not severe; it is rather, if the friction be vigorous, an itching, which soon disappears if the skin be afterwards rubbed with oil. Men and women often have recourse to this revulsive with great advantage. *L. stimulans* MIQ. (*Urtica stimulans* L. FIL., *Suppl.*, 418), of Java, produces, according to LESCHENAULT, the same effects as *L. crenulata*, but less energetic. However, he relates that in Java they rub buffaloes with it to excite them to fight with tigers. *Urtica ferox*, of New Zealand (*Ogna-wa* of the natives), gives a painful sting that lasts four days (COLLENSO); and *U. urentissima*, of Timor (vulg. *Daoun setan*, or *Devil's Leaf*), is said by the natives to produce injuries that last a year, and may even cause death. ENDLICHER ascribes the causticity of the Nettles to carbonate of ammonia, but the liquid has an acid reaction. The American species, *Urtica baccifera*, *caravellana*, *pumila*, are also cited as urticating (ROSENTH., *op. cit.*, 200).

[2] Certain peculiar properties are ascribed to *Bœhmeria caudata* (vulg. *Asapeixe*), used in baths in Brazil, for hæmorrhoids; *Pilea mucosa*, prescribed in dysuria; and *Urera baccifera*, much used as an aperient and resolvent in the Antilles, in a decoction or poultice.

[3] WEDD., *Monogr.*, 48. *Urtica dioica* was formerly regarded as aperient, astringent, emmenagogue, excitant (GUIB., *loc. cit.*, 239). Even volumes have been written on its virtues, its properties as a drug, a textile, a dye stuff, on its oleaginous seeds as nutritious for man or beast. *U. pilulifera* has been vaunted as a diuretic, astringent, and anti-choleraic; its roots are used as a yellow dye in Sweden. *U. membranacea* was reputed an emmenagogue, aphrodisiac, &c.

[4] *Parietaria officinalis* L., *Spec.* (ed. 1), 1052.—WEDD., *Monogr.*, 506, n. 1; *Prodr.*, 235[42], n. 1.—MÉR. & DEL., *Dict. Mat. Méd.*, v. 202.—GUIB., *loc. cit.*, 329.—A. RICH., *Elém.*, ed. 4, i. 247.—GREN. & GODR., *Fl. de Fr.*, iii. 109.—RÉV., in *Fl. Méd. du xixe Siècle*, iii. 10.—*P. diffusa* KOCH, *Syn.*, 636.—*P. judaica* VILL., *Fl. Dauph.*, ii. 346 (nec *alior.*).—*P. maderensis* REICHB., in *Bot. Zeit.* (1831), 131 (*Wall Pellitory*, *Common Pellitory*, *Herbe du verre*, *de none*, *de muraille*, *de Notre-Dame*, *Opératoire*, *Casse-pierre*, *Epinard de muraille*, *Morelle de muraille*, *Espargoule*, *Panatage*, *Vitriole*, *Perce-muraille*).

[5] *U. dioica*, *pilulifera*, *membranacea*, *simensis* (*Sama* of the Abyssinians), &c.

[6] Notably *P. muscosa*, *peploides*, *Wightii*, *lucens*, &c. *P. argentea* DC. is used to make a sort of tea.

[7] WEDD., *Monogr.*, 46. The fleshy root of *P. tuberosa* is eaten in India, raw or cooked.

[8] *E. platyphyllum* and *lineolatum*, among others, from the East Indies.

Urticaceæ deserve mention from an industrial point of view, since their liber is often textile. Without noticing *Urtica dioica, cannabina, parvifolia*, &c., which even in France have been suggested as a substitute for Hemp, or *Girardinia heterophylla*,[1] *Pipturus propinquus*,[2] and *Maoutia Puya*,[3] also used for textile fabrics in hot countries, we must pause a little on the China Grass, *Ma* of the Chinese,[4] often termed in France *Chanvre de la Chine* (Chinese Hemp). This is *Bœhmeria nivea*[5] (fig. 541), a native of Tropical Asia, chiefly cultivated in the temperate and warm regions of the East, China, Bengal, Assam, Silhet, &c. Its culture has also been essayed in the warmest parts of Europe. The fibre obtained from it by steeping is the chief textile material used by the inhabitants of the Indian Archipelago; from it they make cordage, nets, and especially body-clothing, that is light, cool, readily absorbing the perspiration, strong, and most durable against damp.

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1 DCNE., in *Jacquem. Voy., Bot.*, iv. 151, t. 153.—WEDD., *Monogr.*, 164, n. 1.—*Urtica palmata* FORSK., *Fl. Ægypt.-Arab.*, 159.

2 WEDD., *Monogr.*, 447, n. 3.—*Urtica argentea* FORST., *Prodr.*, n. 343.—*U. cinerascens* BL., *Bijdr.*, 497. From this good cord is made in Tahiti.

3 WEDD., *Monogr.*, 477, t. 16, B.—*Urtica Puya* WALL., *Cat.*, n. 4605.

4 Or *Chû-ma, Tchou-ma* in China, *Rhea* in Bengal, *Ramie* in Java, *Caloiee* in Sumatra.

5 HOOK. & ARN., *Beech. Voy., Bot.*, 214; in *Journ. of Bot.* (1851), t. 8.—MIQ., *Pl. Jungh.*, 33; *Fl. Ind.-Bat.*, i. p. ii. 253.—WEDD., *Mon.*, 380, t. 11, figs. 10–17; *Prodr.*, 206, n. 25.—H. BN., in *Dict. Encycl. des Sc. Méd.*, x. 15.—? *B. utilis* BL., *Ind. Bij.* (1853), n. 4.—*B. tenacissima* GAUDICH., *Voy. Uran., Bot.*, 500.—*B. candicans* HASSK., *Hort. Bog.*, 79.—*Urtica nivea* L., *Hort. Cliff.*, 441; *Spec.*, 1398.—*U. tenacissima* ROXB., *Fl. Ind.*, iii. 590.—*U. candicans* BL., *Bijdr.*, 503.—*Procris nivea* GAUDICH., *Voy. Uran., Bot.*, 499.—*Ramium majus* RUMPH., *Herb. Amboin.*, v. 214, t. 79. DECAISNE [in *Rev. Hort.*, sér. 4 (1855), n. 9] considered the *Ramie* (*B. utilis*), whose leaves are shorter and not so white below, distinct from the *Ma* (*B. nivea*). ROYLE is of the opposite opinion, and makes them only forms or varieties of one and the same species.—[See WIESNER, *Rohstoffe des pflanzenreiches* (Leips., 1873), 320–322, 386-389. This book is a valuable compendium of Economic Botany.—TR.]

GENERA.

I. URTICEÆ.

1. **Urtica** T.—Flowers monœcious or diœcious; receptacle small convex. Male calyx 4-phyllous; sepals free or connate at very base, subequal, concave inside, outside more or less stinging hispid; bud depressed at apex; præfloration alternative-imbricate; lateral sepals interior. Stamens 4, oppositisepalous; filaments free, inserted under generally cupuliform hyaline rudiment of gynæceum, rather thick, inflexed in bud, elastically patent at anthesis; anthers 2-celled, introrse; longitudinally rimose. Female calyx 4-phyllous; sepals free or connate at base, decussate-imbricate; lateral 2, in præfloration interior, larger, erect sometimes cucullate; exterior usually much smaller, sometimes subcarinate, patent. Germen free, 1-celled; style short or nearly absent, soon dilated to papillose-stigmatose long penicillate-capitate apex, either deciduous or rather long-persistent. Ovule 1, inserted behind a little above base of cell, ascending suberect orthotropous; micropyle superior, usually adhering to top of cell by narrow obturator; funicle short or nearly absent. Fruit dry, straight, oblong or ovate, compressed rather smooth or verruculose, clothed in enlarged membranous or very rarely rather fleshy calyx. Seed suberect suborthotropous; albumen fleshy; cotyledons of axile fleshy embryo obcordate-rotundate or subelliptical; radicle superior cylindro-conical.—Annual or perennial herbs, rarely frutescent; leaves opposite petiolate, dentate or more rarely entire or incised-lobate, palmately 5–7 or very rarely 3-ribbed, sprinkled with punctiform or more rarely linear cystoliths; stipules lateral interpetiolar or connate in pairs; flowers small glomerulate; glomeruli bracteate at base, spicate or racemose in simple or branching axis (not 2-chotomous) sometimes rather thick, sometimes 1-lateral, more rarely solitary or capitate; inflorescences 1-sexual or androgynous 2-nate in each axile; male pedicels articulate, usually ebracteate (*All cold, temperate, and warm regions*). See p. 497.

2. **Nanocnide** BL.[1]—Flowers monœcious. Male perianth 4, 5-partite; segments externally glabrous or setulose; bud depressed in middle. Stamens as many; anthers uniform. Rudiment of gynæceum hyaline obovoid. Segments of female perianth 4, unequal erect; 2 exterior larger keeled; 2 interior narrower nearly flat. Gynæceum of *Urtica*. Achene straight compressed, enclosed in enlarged calyx. Seed of *Urtica*.—Annual (unarmed ?) herbs; stem slender; leaves alternate crenate, 3–5-ribbed; cystoliths oblong or linear; stipules lateral free; flowers in axillary, solitary or 2-nate glomeruli; males pedunculate rather lax; pedicels articulate; bracts deciduous; females sessile dense; bracts persistent[2] (*China, Japan*[3]).

3. **Hesperocnide** TORR. & GRAY.[4]—Flowers monœcious; males as in *Nanocnide;* calyx 4-merous, outside setulose-hispid. Female perianth tubular oblong-ovoid, hispid all over outside with hamate hairs; mouth minute, 2–4-dentate; teeth 2 larger. Gynæceum of *Urtica*. Achene straight ovate lenticular-compressed apiculate, clothed in enlarged membranous calyx.—Annual herbs, stinging; leaves opposite, incised or crenate-serrate, 3–5-ribbed; cystoliths punctiform or oblong; flowers in axillary androgynous glomeruli; pedicels articulate, ebracteate (*California, Sandwich Islands*[5]).

4. **Obetia** GAUDICH.[6]—Flowers diœcious; male perianth 5-partite; leaves ovate-obtuse puberulous-hispid. Stamens 5. Rudiment of gynæceum globose. Female calyx 4-phyllous; sepals unequal glabrous. Germen at first straight, afterwards oblique; stigma subsessile ovate, villous or penicillate-capitate, persistent, finally inflexed; ovule erect. Achene obliquely ovate compressed, straight-set on pedicel, and loosely involucrate by enlarged membranous calyx; both faces scrobiculate concave rather smooth; edges acutate. Seed nearly of *Urtica;* cotyledons longer than radicle, transversely oblong-rotundate, emarginate at base and apex.—Stinging shrubs; leaves alternate,

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[1] *Mus. Lugd.-Bat.*, ii. 154.—WEDD., *Monogr.*, 289, t. 9, B; *Prodr.*, 68.

[2] A genus referred by BLUME to *Procrideæ*, but it agrees better (according to WEDD.) in perianth, stigma, habit, and deficiency in staminodes with *Urticeæ*.

[3] Spec. 2. WEDD., *loc. cit.*

[4] In *Whippl. Exp.*, *Bot.*, 83. — WEDD., *Prodr.*, 67.

[5] Spec. 2. WEDD., *Monogr.*, 67 (*Urtica*).

[6] *Voy. Bonite*, *Bot.*, t. 82.—WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 178; *Monogr.*, 106, t. 1, B; *Prodr.*, 69.

lobate or coarsely crenate, penniveined or subdigitiveined; cystoliths punctiform; stipules lateral-axillary free; flowers in loosely cymose-racemose glomeruli; pedicels terete; bracts linear (*Madagascar*[1]).

5. **Fleurya** GAUDICH.[2]—Flowers monœcious or diœcious. Male calyx 4, 5-partite; bud umbilicate; outside glabrous or variously clothed. Stamens 4, 5. Rudiment of gynæceum globose, clavate or sublobate. Female calyx 4-lobed or 4-partite; segments subequal or more often unequal; one (superior) of the exterior (smaller than interior) rotundate, cucullate or furnished with a stinging hair; the other ovate lanceolate or minute. Germen (of *Obetia*) finally more or less oblique; stigma sessile, ovate lanceolate or linear, persistent and finally uncinate, sometimes 2, 3-partite; lobes connivent; one soon elongated; the other 2 rudimentary. Achene obliquely ovate or rotundate, obliquely set on articulate pedicel, and falling from it at maturity with persistent slightly enlarged calyx. Seeds sparingly albuminous at apex; cotyledons of rather fleshy embryo transversely elliptical-rotundate emarginate.—Annual herbs, stinging or almost unarmed; leaves alternate, serrate or crenate-dentate; cystoliths linear; stipules axillary, 2-fid; flowers[3] in small 2-chotomous-scorpioid cymes or in subdistichous racemose axillary glomeruli; males and females in the same inflorescences or distinct; pedicels 1, 2-articulate; females cylindrical or more rarely compressed below flower (*All Tropical regions*[4]).

6. **Laportea** GAUDICH.[5]—Flowers monœcious or diœcious. Male calyx 4–5-partite, in bud depressed in middle, glabrous or more or less hispid. Stamens 4, 5. Rudiment of gynæceum subglobose.

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[1] Spec. 2. POIR., *Dict.*, iv. 638, n. 10 (*Urtica*).—BORY, *Voy.*, i. 281 (*Urtica*).—GAUDICH., *Voy. Uran.*, *Bot.*, 496 (*Urera?*).

[2] *Voy. Uran.*, *Bot.*, 497.—ENDL., *Gen.*, n. 1879, d.—WEDD., in *Ann. Sc. Nat.*, sér. 3, xviii. 204; *Monogr.*, 109, t. 1, A; *Prodr.*, 70.—*Schychowskia* ENDL., in *Ann. Wien.*, i. 187, t. 13.

[3] Females greenish; males whitish or pink.

[4] Spec. about 8. L., *Spec.*, 1397 (*Urtica*).—PLUM., *Cat.*, 11.—JACQ., *Hort. Schœnbr.*, iii. t. 388.—FORSK., *Fl. Æg.-Arab.*, 160.—FORST., *Prodr.*, 344.—BL., *Bijdr.*, 503.—H. B. K., *Nov. Gen. et Spec.*, ii. 42 (*Urtica*).—HOOK. & ARN., in *Beech. Voy.*, *Bot.*, iv. 69.—A. RICH., *Fl. Cub.*, ii. 224 (*Urtica*).—GRISEB., *Fl. Brit. W.-Ind.*, 154.—MIQ., in *Zoll. et Mor. Verz.*, 106; in *Mart. Fl. Bras.*, *Urtic.*, 196.

[5] *Voy. Uran.*, *Bot.*, 498.—ENDL., *Gen.*, n. 1879, c.—WEDD., *Mon.*, 121, t. 2–4; *Prodr.*, 77.—*Dendrocnide* MIQ., *Pl. Jungh.*, 29.—*Sclepsion* RAFIN., mss.—*Discocarpus* LIEBM. (nec KL., nec PFEIFF., ex WEDD., *loc. cit.*).

Female calyx (persisting almost unchanged around fruit) membranous, 4-lobed or 4-partite; segments equal, or sometimes more or less unequal and dissimilar among themselves (as in *Fleurya*). Germen finally oblique ovoid; stigma sessile, linear-elongated or rarely short, persistent; ovule erect or ascending. Achene obliquely ovate or rotundate, sometimes slightly drupaceous and ventricose, more often compressed, sometimes very abruptly narrowed at base; faces smooth or granulate; edges equal or thickened. Cotyledons of thinly albuminous embryo rotundate, emarginate at base, sometimes truncate at apex.—Lofty trees or more often small trees, shrubs, or perennial herbs, sparingly or plentifully stinging-hispid; leaves alternate, entire or variously dentate penniveined; cystoliths punctiform; stipules axillary, 2-ribbed, entire or 2-fid, deciduous; flowers glomerulate; glomeruli 1-sexual in much branching axillary racemes (male inflorescences in some species double superior); pedicels articulate; females sometimes variously dilated or fasciate; bracts varying in form or 0[1] (*Tropical Asia, Oceania, North America*[2]).

7. **Urera** GAUDICH.[3]—Flowers monœcious or diœcious. Male calyx 4, 5-partite; bud subumbilicate. Stamens 4, 5; anthers reniform. Rudiment of gynæceum subglobose, depressed or cupulate. Female calyx 4-lobed; lobes very unequal; interior 2 larger; of the exterior one anterior, very small, or even deficient. Germen straight or oblique subovoid; stigma sessile penicilliate-capitate, rotundate, or more rarely lanceolate and densely villous-papillose, persistent; ovule erect or subascending. Achene almost dry, straight or oblique, convex or compressed on either side, smooth or tuberculate, clothed

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[1] 4 sections, according to WEDD., thus: 1. *Sclepsion*. Female flowers 4-partite; segments very unequal; pedicels very often winged.—2. *Sarcopus* (WEDD.). Female flower that of *Sclepsion*; fruiting pedicels botuliform thickened.—3. *Discocarpus* (LIEBM.). Female flowers those of *Sclepsion*; fruiting pedicels not winged nor fleshy.—4. *Dendrocnide*. Lobes of female calyx subequal; fruiting pedicels unthickened, cylindrical or 0; extreme small twigs of inflorescence sometimes fastigiate-dilated.

[2] Spec. 20–25. L. F., *Suppl.*, 418 (*Urtica*).—RUMPH., *Herb. Amboin.*, vi. t. 20, fig. 1 (*Urtica*).—POIR., *Dict.*, Suppl., iv. 214 (*Urtica*)?—JACQ., *Fram. Bot.*, t. 33 (*Urtica*).—BL., *Bijdr.*, 496, 504 (*Urtica*).—ROXB., *Fl. Ind.*, iii. 587 (*Urtica*).—K., *Ind. Sem. Hort. Berol.* (1846), 11.—BENTH., in *Hook. Niger*, 517 (*Fleurya*).—SIEB. & ZUCC., in *Abd. d. Math.-Phys. Kl. d. Baier. Akad.*, iv. p. iii. 214.—LIEBM., in *Kön. Densk. Vid. Selsk. Skr.*, xviii. 60 (*Discocarpus*).—WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 178 (*Urera*).—MIQ., *Fl. Ind. Bat.*, i. p. ii. 230, 254 (*Bœhmeria*); *Pl. Jungh.*, 30 (*Dendrocnide*).—SEEM., *Fl. Vit.*, 238, 239, t. 60; *Acc. Gov. Miss. Viti Isl.*, 427.—HOOK. F., in *Journ. Linn. Soc.*, vii. 215.—WALP., in *Nov. Act. Acad. Leop.-Carol.*, xvi., Suppl. ii. 422.

[3] *Voy. Uran.*, *Bot.*, 496.—WEDD., *Monogr.*, 143, t. 2, A; *Prodr.*, 88.

in accrete baccate and coloured calyx. Seed very sparingly albuminous; cotyledons of embryo rotundate emarginate on both sides.—Small trees, shrubs or erect undershrubs, sometimes climbing, plentifully or more rarely sparingly stimulate or aculeate (sometimes unarmed?); leaves alternate entire, crenate, dentate or incised, penniveined or digitiveined; cystoliths punctiform, oblong or fusiform; stipules axillary, 2-keeled, entire or 2-fid, deciduous; flowers[1] either discrete, or in glomeruli (sometimes capituliform); glomeruli aggregated into 1-parous or 2-chotomously 2-parous cymes; inflorescences solitary in each axil, 1-sexual; male pedicels articulate; bracts usually 0 (*Tropical, rarely Extra-tropical America, Oceania, and Africa*[2]).

8. **Scepocarpus** WEDD.[3]—Flowers diœcious (?); males...? Female calyx tubular, wholly including germen; mouth contracted inconspicuously denticulate. Germen straight oblong; ovule erect subsessile; stigma sessile penicillate-capitate and rotundate, persistent. Achene obliquely set on thickened pedicel, obliquely ovate, convex on both sides rather smooth, closely clothed by baccate[4] perianth. Seed of *Urera*.—A climbing stinging shrub; leaves alternate dentate, 3-ribbed very small subpunctiform; stipules axillary entire, deciduous; female flowers glomerulate; glomeruli in 1-parous or spuriously 2-chotomous axillary cymes (*Tropical Western Africa*[5]).

9. **Gyrotænia** GRISEB.[6]—Flowers diœcious. Male calyx 4-partite; segments orbicular; bud subumbilicate. Stamens 4; anthers reniform. Rudiment of gynæceum globose. Female calyx small, 2-lobed; lobes equal, ciliate-denticulate at edge. Germen straight ovoid-oblong; ovule erect; stigma sessile penicillate-capitate rotundate, persistent. Achene (almost dry) scarcely oblique ovate subcompressed, accompanied at base by unchanged calyx.—Shrubs or

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[1] Coloured.

[2] Spec. about 18. L., *Spec.*, 1398 (*Urtica*).—SW., *Fl. Ind. Occ.*, i. 322 (*Urtica*).—POIR., *Dict.*, Suppl., iv. 224 (*Urtica*).—JACQ., *Hort. Schœnbr.*, iii. 71, t. 386 (*Urtica*).—H. B. K., *Nov. Gen. et Spec.*, ii. 41 (*Urtica*).—A. RICH., *Fl. Abyss. Tent.*, iii. 260 (*Urtica*).—WEDD., in *Ann. Sc. Nat.*, sér. 3, xviii. 177, 203; sér. 4, i. 177.—GRISEB., *Fl. Brit. W.-Ind.*, 154.—SEEM., *Herald Bot.*, 194, n. 494.—MIQ., in *Mart. Fl. Bras.*, *Urtic.*, 194; *Fl. Ind. Bat.*, i. p. ii. 232.

[3] *Prodr.*, 98.

[4] "Coloured."

[5] Spec. 1. *S. Mannii* WEDD., *loc. cit.*

[6] In *Mem. Amer. Acad. Sc. et Art.*, n. ser., viii. (1860), 174; *Fl. Brit. W.-Ind.*, 155.—WEDD., *Prodr.*, 99.

small trees, not stinging (?); leaves alternate, entire or serrate; cystoliths punctiform or oblong; stipules axillary entire, 2-ribbed; flowers spicate or capitate axillary; females inserted in fleshy receptacle, ebracteate[1] (*Antilles*[2]).

10. **Girardinia** GAUDICH.[3]—Flowers monœcious or diœcious. Male calyx 4, 5-partite; segments ovate hispid. Stamens, 4, 5. Rudiment of gynæceum globose or cupulate. Female calyx bipartite; segments very dissimilar; one larger subtubular, 2-fid, denticulate at apex; the other ovate smaller or very small linear, sometimes abortive. Germen ovoid lanceolate; ovule usually ascending; funicle slender; stigma filiform, usually minutely papillose, persistent. Achene accompanied at base by persistent patent calceolate calyx, obliquely rotundate compressed, smooth or thinly granulose, or very rarely setulose on both subconvex faces. Cotyledons of sparingly albuminous embryo rotundate, emarginate at both ends; radicle oblong.—Annual or perennial herbs, more or less woody at base, tall erect, armed with hairs or stinging prickles; leaves alternate serrate or lobate, 3-ribbed; cystoliths punctiform; stipules of both leaves connate, not persistent to 1 axillary, entire or 2-fid at apex; male flowers[4] early deciduous, in glomeruli collected into a simple or forked, sometimes much branching raceme; bracts few minute; pedicels articulate; females in compound cymiferous and (in superior twigs) scorpioid racemes; cymes very dense and bristling with stings when fruiting (*Warm and Temperate Asia and Africa*[5]).

II. PROCRIDEÆ.

11. **Procris** COMMERS.—Flowers monœcious or diœcious. Male calyx 5-partite; sepals obovate muticous rather fleshy. Stamens 5,

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[1] "Between this genus and *Urera* there is no essential difference, except that the 2-lobed perigonium is little enlarged after anthesis." (WEDD.)

[2] Spec. 3. POIR., *Dict.*, iii. t. 763, fig. 2 (*Procris*).—PERS., *Syn.*, ii. 556 (*Bœhmeria*).—WEDD., *Monogr.*, 155 (*Urera*).

[3] *Voy. Uran.*, *Bot.*, 498.—ENDL., *Gen.*, n. 1879, e.—WEDD., *Monogr.*, 163, t. 2, B; *Prodr.*, 100.

[4] Greenish.

[5] Spec. about 7. BURM., *Zeyl.*, 232 (*Urtica*).—FORSK., *Fl. Æg.-Arab.*, 159.—VAHL, *Symb.*, i. 76.—LINK, *Enum.*, ii. 285.—ZENK., *Pl. Ind. Schm.*, dec. 1, n. 3, 4.—A. RICH., *Fl. Abyss. Tent.*, ii. 262.—WIGHT, *Icon.*, ii. t. 687.—MIQ., *Fl. Ind. Bat.*, i. p. ii. 233; *Pl. Jungh.*, 32 (*Urtica*).—DCNE., *Voy. Jacquem.*, *Bot.*, 151.—WEDD., in *Ann. Sc. Nat.*, ser. 3, xviii. 203; ser. 4, i. 181.—BL., *Mus. Lugd.-Bat.*, ii. 158.

inserted under globose or obovoid rudiment of pistil. Calyx of female flower 3, 4-phyllous; sepals obovate cucullate rather fleshy. Hypogynous staminodes 3, 4, oppositisepalous, minute or 0. Germen ovate, shorter than calyx; apex stigmatose long penicillate, soon evanescent; ovule subbasilar; funicle very short. Fruit ovate or elliptical subbaccate striolate-painted, covered with persistent fleshy calyx; capitulum finally fragariiform when fruiting. Cotyledons of sparingly albuminous or exalbuminous turbinate embryo broadly elliptical, longer than conical radicle.—Succulent shrubs or undershrubs, almost erect or ascending, usually glabrous; leaves 2-stichous inequilateral, and very unequal in size (each larger leaf alternating with a very small bracteiform or abortive one), entire or sinuate penniveined; cystoliths very small linear; stipules entire axillary; male flowers in glomeruli (rarely capituliform); females densely inserted in fleshy globose or clavate receptacle; cymes and capitula solitary; females sessile or pedunculate; male pedicels ebracteate; female bracts linear-spathulate, often glandular at apex (*Tropical Africa, Asia, and Oceania*). See p. 500.

12. **Elatostema** FORST.[1]—Flowers monœcious or diœcious. Male calyx 4, 5-partite; segments mucronate below apex. Stamens 4, 5; filaments more or less adnate to calyx at base; anthers oblong. Rudiment of gynæceum conical, clavate or glabrous. Female calyx 3- or more rarely 4, 5-phyllous, or very small or imperfect, segments lanceolate or linear-subulate, sometimes ciliate. Germen ellipsoid; ovule erect; funicle short; stigma sessile, bearing a brush of papillæ or hairs, soon evanescent. Achene ovate or elliptical rather compressed, smooth, more rarely furrowed, often punctulate-painted; pericarp thin fragile; embryo of erect seed exalbuminous or sparingly albuminous; cotyledons elliptical of nearly same length as thick radicle.—Undershrubs or more often perennial or annual herbs; leaves distichous subopposite or more often (by abortion of one of each pair) alternate, inequilateral (edge of narrower side of limb looking upwards), entire or variously dentate, 3-pli- or penni-

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[1] *Char. Gen.*, 53.—J., *Gen.*, 403.—GAUDICH., *Voy. Uran., Bot.*, 493.—ENDL., *Gen.*, n. 1880.—WEDD., *Monogr.*, 290, t. 9, c, 10; *Prodr.*, 171.—*Procris* SPRENG., *Syst.*, iii. 846 (nec COMMERS., nec GAUDICH.).—*Langeveldia* GAUDICH., *loc. cit.*

costate; cystoliths usually linear; petiole short or nearly absent; stipules axillary entire, none the less developed to deficient leaves; flowers collected in pedunculate or subsessile 1-sexual capitula; capitula solitary or paired at each node; receptacle narrow or dilate, flat or convex, sometimes fig-shaped, regular or irregular, subcarneous; bracts involucrant more or less coalite or more rarely free; inflorescences sometimes exinvolucrate[1] (*East India, Oceania, Madagascar, Tropical Africa*[2]).

13. **Pellionia** GAUDICH.[3]—Flowers monœcious or diœcious. Male calyx 4- or more often 5-partite; segments obtuse, mucronate at top of back, membranous at edge, much imbricate. Stamens 4, 5; anther-cells oblong-reniform. Rudiment of gynæceum conical glabrous. Female calyx 4, 5-partite, persistent; segments equal or unequal, bare or mucronate. Germen elliptical rather compressed (shorter than calyx); ovule erect; stigma sessile penicillate. Achene subcylindrical or compressed smooth, punctulate-painted or more often tuberculate. Seed erect; cotyledons of sparingly albuminous embryo usually rotundate, twice as long as thick radicle.—Undershrubs or most often herbs, glabrous or villous; leaves subopposite; one of each pair very small or hardly conspicuous, sometimes altogether abortive;[4] both inequilateral (edge of narrower side looking upwards); entire or serrate penniveined or 3-costate; cystoliths fusiform; stipules supra-axillary, sometimes elongated; flowers glomerate or densely or rather laxly cymose; inflorescences sessile or pedunculate axillary, more often solitary; glomeruli exinvolucrate; floral bracts small, 3-angular lanceolate[5] (*Tropical and Temperate Asia, Oceania*[6]).

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[1] Hence, according to WEDD., 2 sections, thus: 1. *Androsyce*. Inflorescence exinvolucrate, receptacle fig-shaped.—2. *Euelatostema*. Male inflorescence usually distinct involucrate, receptacle commonly discoidal.

[2] Spec. about 50. POIR., *Dict.*, v. 628 (*Procris*).—HAM., in *Don Prodr. Fl. Nepal.*, 60 (*Procris*).—HOOK. & ARN., *Beech. Voy.*, *Bot.*, 70 (*Procris*).—PERS., *Syn.*, ii. 556 (*Bœhmeria*).—AD. BR., in *Voy. Coq.*, *Bot.*, 206.—WALL., *Cat.*, n. 4628–4636, 7273.—BL., *Bijdr.*, 509 (*Procris*).—WIGHT, *Icon.*, t. 2091, figs. 3, 4 (*Procris*).—GUILLEM., in *Ann. Sc. Nat.*, sér. 2, vii. 183.—ZOLL. & MOR., *Verz.*, 74, 102 (*Procris*).—MIQ., *Fl. Ind. Bat.*, i. p. ii. 241.—HASSK., *Hort. Bog.*, 79.—WEDD., in *Ann. Sc. Nat.*, ser. 4, i. 188.—HOOK. F., *Fl. N.-Zel.*, 227.—SEEM., *Fl. Vit.*, 240.

[3] *Voy. Uran.*, *Bot.*, 494.—ENDL., *Gen.*, n. 1883.—WEDD., *Monogr.*, 282, t. 5, 6, A; *Prodr.*, 165.

[4] Whence leaves seem alternate.

[5] Habit of *Elatostema*, but "inflorescence rather of *Pilea*. The essential characters of the genus are taken from the number of perigynous female segments." (WEDD., *loc. cit.*)

[6] Spec. 25. BL., *Bijdr.*, 510 (*Procris*).—WALL., *Cat.*, n. 7272 (*Procris*).—SIEB. & ZUCC.,

14. **Pilea** LINDL.[1]—Flowers monœcious. Male calyx 4-partite (very rarely 2, 3-partite); segments concave rather fleshy, usually thickly mucronate under membranous apex. Stamens as many. Rudiment of gynæceum conical. Female calyx 3-partite; segments rather fleshy, usually unequal; lateral rather flat, usually smaller; third gibbous or cucullate. Stamens rudimentary, oppositisepalous, squamiform inflexed. Germen straight rather compressed; ovule suberect; funicle slender oblique; stigma sessile shortly penicillate. Achene rotundate or ovate, suboblique compressed, smooth or rather scabrous, almost naked or clothed by slightly enlarged calyx. Cotyledons of exalbuminous or sparingly albuminous embryo rotundate or ovate, longer than conical radicle.—Undershrubs or very often annual or perennial herbs, erect or prostrate and rooting; leaves opposite, usually petiolate, generally unequal or 2-morphous in the same pair, equilateral or more often inequilateral, entire or variously dentate, 3-costate 3-plicostate or more rarely penniveined; ribs often immersed in rather fleshy limb; cystoliths linear fusiform punctiform or stellate; stipules 2, connate to one, intra-axillary entire deciduous or persistent; flowers[2] glomerulate; glomeruli sometimes solitary or rarely geminate in often 2-stichous branching cymes; male pedicels articulate; floral bracts shorter than calyx or rarely large; males soon deciduous[3] (*Tropical and subtropical regions*[4]).

15? **Achudemia** BL.[5]—Flowers polygamous. Male flower of *Pilea*, 5-merous; sepals unequal. Female and hermaphrodite flowers 5-merous; perianth-leaves a little unequal. Stamens 5,

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in *Abh. d. Math.-Phys. Kl. d. Baier. Ak.*, iv. (iii.), 317 (*Procris*).—BENTH., *Fl. Hongkong.*, 330.—MIQ., *Fl. Ind. Bat.*, i. p. ii. 239.—SEEM., *Fl. Vit.*, 239.—WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 187 (*Pilea*).—WALP., *Ann.*, i. 647 (*Procris*).

[1] *Collect.*, t. 4.—ENDL., *Gen.*, n. 1822.—WEDD., *Monogr.*, 176, t. 6, C, 7, 8; *Prodr.*, 104, 235 [63].—*Dubrueilia* GAUDICH., *Voy. Uran.*, *Bot.*, 495.

[2] Males pink, whitish or pale-greenish; females green or reddish.

[3] WEDDELL divides the very numerous artificial species first by the shape of the leaves, whence 3 sections: 1. *integrifoliæ*; 2. *heterophyllæ*; 3. *dentatæ*.

[4] Spec. descr. about 160. SW., in *Act. Holm.* (1787), 61; *Fl. Ind. Occ.*, 305 (*Urtica*).—HOOK. & ARN., *Beech. Voy.*, *Bot.*, 96.—WIGHT, *Icon.*, t. 1973.—HOOK. F., *Fl. Antarct.*, 344.—WEDD., in *Ann. Sc. Nat.*, sér. 3, xviii. 208; sér. 4, i. 186.—BL., *Mus. Lugd.-Bat.*, ii. 45, fig. 18.—A. GRAY, *Man.*, ed. 5, 437.—FENZL., in *Denk. d. Wien. Kais. Akad. d. Wiss.*, i. 4.—LIEBM., in *Kœn. Dansk. Vid. Selsk. Skr.*, 5 *Rækk. Nat. og Math. Afd.*, ii. 296.—GRISEB., *Cat. Pl. Cub.*, 59; *Fl. Brit. W.-Ind.*, 157.—SEEM., *Bot. Her.*, 194.—MIQ., in *Zoll. et Mor. Verz.*, 105; *Fl. Ind. Bat.*, i. p. ii. 236; in *Mart. Fl. Bras.*, *Urtic.*, 200.—HANCE, in *Ann. Sc. Nat.*, sér. 5, v. 242.

[5] *Mus. Lugd.-Bat.*, ii. 57, t. 20.—WEDD., *Monogr.*, 278, t. 9, A; *Prodr.*, 163.

sterile squamiform inflexed in female flower. Achene lenticular-compressed subinflated, clothed in persistent calyx. Embryo of erect seed sparingly albuminous; cotyledons flat-convex; radicle short.—A herb; aspect of *Pilea*; leaves decussately opposite, petiolate equilateral, dentate, 3-costate; stipules axillary; flowers of both sexes in the same glomerulus; glomeruli 1-lateral subspicate in long-pedunculate sparingly branching cymes; pedicels of male flowers articulate; female flowers subsessile, bracteolate at base[1] (*Java*[2]).

16. **Lecanthus** WEDD.[3]—Flowers monœcious or diœcious. Male calyx 4, 5-partite; segments petaloid a little unequal, gibbous-cucullate at back; bud obconical. Stamens as many. Female calyx 3-partite or 3-phyllous; leaves in fertile flowers, rather flat denticulate, in sterile more or less cucullate. Rudiments of stamens scale-shaped inflexed, in sterile flowers often subequal to perianth. Germen ovate nearly straight compressed; ovule erect; funicle short; stigma sessile penicillate, soon disappearing. Achene ovate-subcompressed straight striate. Albumen of erect seed rather thick; cotyledons elliptical longer than conical radicle.—An annual herb; leaves petiolate opposite, in the same pair unequally large, equilateral, usually serrate, 3-ribbed, spreading; cystoliths linear; stipules axillary; flowers[4] inserted in discoid peltate or campanulate receptacle; receptacles exinvolucrate axillary solitary pedunculate, 1-sexual; male capitula sometimes very small;[5] flowers generally pedicelate, ebracteate; female receptacle denticulate at edge; fertile and sterile flowers intermingled[6] (*East India, Tropical east and west Africa*[7]).

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[1] "A genus distinct from *Pilea* by its polygamous flowers and female perigonium, like the male 5-partite, not 3-partite." (WEDD.)

[2] Spec. 1. *A. javanica* BL., *loc. cit.*—MIQ., *Fl. Ind. Bat.*, i. p. ii. 238.—*Pilea subpuberula* MIQ., in *Zoll.* et *Mor. Verz.*, 105; *Fl. Ind. Bat.*, i. p. ii. 236.—WEDD., *Monogr.*, 244.

[3] In *Ann. Sc. Nat.*, sér. 4, i. 187; *Monogr.*, 279, t. 9, C; *Prodr.*, 164.

[4] Males whity-brown; females green.

[5] Counterfeiting flower.

[6] Differing from *Elatostema* in its at first sight decussate leaves, from *Pilea* in its capitate flowers.

[7] Spec. 1. *L. peduncularis* WEDD., *Prodr.*—*L. Wightii* WEDD., in *Ann. Sc. Nat.*, *loc. cit.*; *Monogr.*, 280.—*L. major* WEDD., *loc. cit.*—MIQ., *Fl. Ind. Bat.*, i. p. ii. 238.—*Procris obtusa* ROYLE, *Ill. Himal.*, t. 83, figs. 2, 3.—*P. peduncularis* WALL., *Cat.*, n. 4634 (part.).—*Elatostema ovatum* WIGHT, *Icon.*, t. 1985.—*E. oppositifolium* DALZ., in *Hook. Journ.*, iii. 179.

III. BŒHMERIEÆ.

17. **Bœhmeria** JACQ.—Flowers monœcious or diœcious. Male calyx 4-partite or 4-lobed (very rarely 3- or 5-partite); lobes leafy ovate, subacuminate or mucronate under apex, valvate. Stamens as many superposed; inserted under clavate or subglobose rudiment of gynæceum, glabrous or shortly lanate at base. Female calyx tubular, compressed or ventricose, 2–4-dentate at contracted mouth. Germen included, free or coherent with calyx, sessile or stipitate; style elongated filiform, on one side papillose-stigmatose; ovule suberect or ascending. Fruit included in marcescent calyx; pericarp crustaceous thin or nucamentaceous; albumen of suberect seed more or less copious; cotyledons of rather fleshy embryo elliptical, usually a little longer than conical radicle.—Small trees, shrubs, or undershrubs, usually downy; leaves opposite or alternate, either equilateral homomorphous, or more or less unequilateral 3-morphous, variously dentate (very rarely unequal-2-lobed), 3-ribbed petiolate at base; cystoliths minute punctiform; stipules axillary, free or more or less highly connate, commonly deciduous; flowers glomerulate shortly scarious-bracteate; glomeruli axillary in spikes or branching racemes (*All Tropical and subtropical regions*). See p. 502.

18. **Pouzolsia** GAUDICH.[1]—Flowers monœcious or more rarely diœcious. Male calyx 4, 5-lobed or partite, rarely 3-partite; lobes ovate-acuminate, convex at back (neither mucronate, nor transversely infract), valvate. Stamens 3–5. Rudiment of gynæceum obovate or clavate-glabrous or lanate. Female calyx tubular, often ovate ribbed; mouth contracted, 2–4-dentate. Germen sessile included, usually free, more rarely more or less adnate to calyx; ovule erect or ascending; stigma filiform, articulate at base and usually falling[2] before ripeness of fruit, sometimes laterally villous. Achene clothed with marcescent calyx (almost unchanged, or accrete with ribs or

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[1] *Voy. Uran., Bot.*, 503.—WEDD., *Monogr.*, 389, t. 13, A; *Prodr.*, 219.—*Leptocnide* BL., *Mus. Lugd.-Bat.*, ii. 193.—*Stachyocnide* BL., *loc. cit.*—*Leucococcus* LIEBM., in *Kœn. Dansk. Vid. Selsk. Skr.*, 5 *Rækk. Nat. og Mat. Afd.*, ii. 211.—*Margarocarpus* WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 203, 205.

[2] Detained inside the now elongated neck of calyx, and wrongly said to be persistent at top of achene.

wings); pericarp crustaceous stinging;[1] seed erect or suberect.—Herbs, undershrubs or shrubs; covering 0, or varying; leaves alternate or more rarely opposite, homomorphous or very rarely inequilateral, entire or variously dentate, 3-ribbed; ribs basilar branching, never produced to apex of limb; cystoliths punctiform; stipules free, generally persistent; flowers in axillary or spiked glomeruli; male and female monœcious in different species often mixed; bracts small scarious; male pedicels 0, or articulate (*All Tropical and subtropical regions*[2]).

19. **Memorialis** HAM.[3]—Flowers monœcious or rarely diœcious, nearly of *Pouzolsia*; segments of male calyx 3–5, ovate, shortly acuminate infract at top of back, transversely crested; crest wrinkled or more often ciliate; bud campanulate or turbinate; præfloration valvate. Stamens 3–5. Rudiment of gynæceum linear-conical glabrous. Female flower and fruit of *Pouzolsia*; pericarp black; wings of calyx (when present) usually marginal.—Herbs, perennial or suffruticose at base; leaves opposite, ternate, or superior alternate, homomorphous and equilateral, entire 3- or 3-pli- or 5-plicostate; ribs basilar, produced from base to apex of blade, simple; cystoliths punctiform; stipules axillary or axillary-lateral, or free, or connate with stipules of opposite leaf; flowers monœcious in axillary or spiked glomeruli, with both sexes mixed in some species; bracts small scarious (*East, continent and islands of India*[4]).

20. **Sarcochlamys** GAUDICH.[5]—Flowers diœcious. Male calyx 5-partite; segments ovate-obtuse, imbricate. Stamens 5. Rudiment of gynæceum conoid small densely lanate. Female calyx shortly unequal-4-lobed, campanulate, soon (owing to 1-laterally much accrete tube) gibbous; limb altogether lateral subanatropous

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[1] Black, brownish, or ivory-white.

[2] Spec. about 35. L., *Fl. Zeyl.*, n. 371 (*Parietaria*).—ROXB., *Fl. Ind.*, iii. 587 (*Urtica*).—BENN., *Pl. Jav. Rar.*, 67.—BENTH., *Niger*, 518; *Fl. Hongkong.*, 331.—WIGHT, *Icon.*, vi. n. 36, 44, 45. t. 1779 *bis*, 1980, 2098–2100.—MIQ., *Fl. Ind.-Bat.*, i. p. ii. 260.—BL., *Mus. Lugd.-Bat.*, ii. 193, 230, 236.—DE SOLMS, in *Schweinf. Beitr. z. Fl. Æth.*, 889.

[3] In *Wall. Cat.*, n. 1598, 4601.—WEDD., *Monogr.*, 415, t. 13, B; *Prodr.*, 235 [2], 235 [63].—*Gonostegia* TURCZ., in *Bull. Soc. Imp. Nat. Mosc.*, xix. (1846), 509.—*Hyrtanandra* MIQ., *Pl. Jungh.*, i. 25; *Fl. Ind. Bat.*, i. p. ii. 260.

[4] Spec. about 12. ROXB., *Fl. Ind.*, iii. 573 (*Urtica*).—WIGHT, *Icon.*, vi. 36 (*Pouzolzia*).—BENN., *Pl. Jav. Rar.*, 66 (*Pouzolzia*).—HASSK., *Cat. Hort. Bogor.*, 80.—WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 205 (*Pouzolzia*).—BL., *Mus. Lugd.-Bat.*, ii. 239 (*Pouzolzia*).—BENTH., *Fl. Hongkong.*, 332.

[5] *Voy. Bonite, Bot.*, t. 89.—WEDD., *Monogr.*, 439, t. 16, C; *Prodr.*, 235[14].

mouth contracted; lobes subconnivent. Germen included in calyx stipitate broadly elliptical oblique; ovule suberect; funicle short ascending; stigma sessile penicillate-capitate persistent. Achene oblique smooth, laxly included in accrete fleshy succulent calyx; seed...?—A shrub; leaves alternate, 3-ribbed serrulate, hoary below; cystoliths punctiform hardly conspicuous; stipules 2, connate to 1, axillary or axillary-lateral 2-fid; flowers glomerate-spicate; spikes axillary solitary or paired; males lax; females very dense (*India*[1]).

21? **Poikilospermum** Zipp.[2]—"Flowers diœcious. Male calyx campanulate, 4-fid; lobes ovate, valvate. Stamens 4. Rudiment of gynæceum obconical glabrous. Female calyx obconical campanulate; mouth very minutely 4-denticulate. Germen altogether included in calyx; stigma sessile capitellate peltate, minutely papillose. Achene baccate, embraced at base by finally accrete fleshy cupulate calyx. Seed of the same form; albumen scanty.—A shrub; leaves alternate, 3-ribbed; stipules axillary; flowers frequently dichotomously cymose"[3] (*Amboyna Islands, Ceram*[4]).

22? **Laurea** Gaudich.[5]—Flowers diœcious. Segments of male calyx 4, rather obtuse puberulous, imbricate? Stamens 4. Rudiment of gynæceum lanceolate, hairy at base, rather long-acuminate-attenuate hispid at apex. Female flower...?—A rather glabrous shrub (aspect of *Piper*); leaves opposite petiolate, slightly unequal in same pair, inequilateral entire, 3-ribbed; cystoliths 0 (?); stipules axillary entire, deciduous; male flowers in very dense spikes, simple or subsimple, axillary, 2-nate[6] (*Guiana*[7]).

23. **Cypholophus** Wedd.[8]—Flowers monœcious or diœcious. Male calyx 4-partite; segments mucronate or bare under apex,

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[1] Spec. 1. *S. pulcherrima* Gaudich., *loc. cit.*—Miq., *Fl. Ind. Bat.*, i. p. ii. 264.—*Urtica pulcherrima* Roxb., *Fl. Ind.*, iii. 587.

[2] Ex Miq., in *Ann. Mus. Lugd.-Bat.*, i. 203.—Wedd., *Prodr.*, 235[15].

[3] A genus differing, according to Miq., from *Sarcochlamys* in its regular female calyx.

[4] Spec. 1. *P. amboinense* Zipp., *loc. cit.*

[5] *Voy. Coq.*, *Bot.*, t. 88.—Wedd., *Monogr.*, 443, t. 12, D; *Prodr.*, 235[14].

[6] A genus too imperfectly known, placed among *Sarcochlamydeæ*, from a certain similarity to *Sarcochlamys*. (Wedd.)

[7] Spec. 1. *L. tiliæfolia* Gaudich., *loc. cit.*—*Piper tiliæfolium* Desvx., in *Ham. Prodr. Fl. Ind. Occ.*, 4.—Miq., *Syst. Piperac.*, 551.—C. DC., *Prodr.*, xvi. 379, 388.

[8] Wedd., in *Ann. Sc. Nat.*, ser. 4, i. 198; *Monogr.*, 433, t. 12, C; *Prodr.*, 235[9].

valvate. Stamens 4. Rudiment of gynæceum obovoid, glabrous except at sparingly hairy base. Female calyx tubular-ventricose; mouth contracted, 2–4- unequal-dentate. Germen included, free from or scarcely adhering to calyx, sessile oblong; ovule suberect; stigma filiform much incurved; convexity hairy or subplumose. Achene obovoid or ellipsoid, sometimes lenticular, clothed with accrete, baccate or rather fleshy, compressed or angulate calyx; pericarp crustaceous, hence often thickened under apex. Seed suberect; albumen not scarce; cotyledons of rather fleshy embryo elliptical, a little longer than radicle.—Small trees or shrubs; leaves opposite petiolate, usually inequilateral and heteromorphous, dentate-serrate; cystoliths punctiform; stipules free axillary-lateral, deciduous; flowers glomerate; glomeruli axillary, 1-sexual or more rarely androgynous capituliform; females very dense, finally amplexicaul; bracts ∞, scarious[1] (*Oceania, Malaysia*[2]).

24. **Touchardia** GAUDICH.[3]—Flowers diœcious. Male calyx nearly of *Cypholophus*, 5-merous; rudiment of gynæceum shortly clavate glabrous. Female calyx subcampanulate, 4-lobed; lobes more or less unequal, angulate, sometimes cucullate, rather fleshy. Germen subequal to calyx, ovoid straight; ovule oblique more or less inflexed on ascending funicle; stigma spathulate, on one face and edges rather long-papillose. Achene ovoid ventricose smooth, for a long time clothed with accrete fleshy calyx.—A shrub; leaves alternate crenate, 3-ribbed; cystoliths punctiform; stipules axillary broad entire, subpersistent; flowers crowded pedicellate in capitula terminating an axillary simple forked or 2-chotomously branching peduncle; bracts linear[4] (*Sandwich Islands*[5]).

25. **Neraudia** GAUDICH.[6]—Flowers diœcious. Male calyx 4-partite; segments ovate-acute rather fleshy, valvate. Stamens 4. Rudiment of gynæceum narrowly conical densely lanate. Female

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[1] A genus with aspect of *Bœhmeria*, also allied by its inflorescence to *Touchardia*, but owing to its distinct stigma, and its fructiferous baccate calyx, placed among *Sarcochlamydeæ*.

[2] Spec. 9. SEEM., *Fl. Vit.*, 242, t. 62 (*Bœhmeria*).—BL., *Mus. Lugd.-Bat.*, 207 (*Bœhmeria*).—MIQ., *Fl. Ind. Bat.*, i. p. ii. 209, 251 (*Bœhmeria*), 262.

[3] *Voy. Bon., Bot.*, t. 94.—WEDD., *Monogr.*, 441, t. 13, C; *Prodr.*, 235 [13].

[4] A genus by its inflorescence strongly allied to *Cypholophus*, by its female calyx (rather young) to *Sarcochlamys*.

[5] Spec. 1. *T. latifolia* GAUDICH., *loc. cit.*

[6] *Voy. Uran.*, *Bot.*, 500, t. 117.—WEDD. *Monogr.*, 437, t. 12, A; *Prodr.*, 235 [16].

calyx tubular-ventricose, tapering at apex; mouth contracted sub-4-dentate. Germen included sessile ovoid; ovule erect; funicle short; stigma elongated-filiform, articulate at glabrous base, deciduous, in other parts villous. Achene depressed-conical, often lobulate at base, included in accrete fleshy globuliform calyx; embryo...?—Shrubs; "juice milky;" leaves petiolate alternate equilateral entire, 3-ribbed; cystoliths punctiform; stipules axillary small; flowers in axillary, usually few-flowered glomeruli[1] (*Sandwich Islands*[2]).

26. **Villebrunea** GAUDICH.[3]—Flowers diœcious. Male calyx 4-partite; segments ovate-acute, rather hispid outside, valvate. Stamens 4. Rudiment of gynæceum obovate-clavate, lanate at base. Female calyx ventricose-tubular; limb very small, 4–5-dentate. Germen adnate to calyx; ovule erect; funicle short; stigma subdiscoid subpeltate, long papillose-ciliate at edge. Achene subnucamentaceous, clothed outside by a fleshy ventricose stratum, obsoletely angulate (formed of adnate accrete calyx and simulating sarcocarp). Seed erect; albumen not scanty; cotyledons of rather fleshy embryo elliptical, subequal to radicle.—Small trees or shrubs; leaves alternate, entire or crenulate, penniveined or 3-ribbed, glabrous or pubescent; stipules connate to 1, axillary, 2-fid; flowers in capitula or dense glomeruli, terminating simple, fasciculate, forked or 2-chotomous peduncles; bracts numerous involucrant coalite around female flower to finally much accrescent fleshy cupule (*India, Malaysia, Oceania*[4]).

27. **Debregeasia** GAUDICH.[5]—Flowers monœcious or diœcious. Calyx 3- or more often 4-partite; segments convex behind, shortly acuminate, valvate. Stamens 3, 4. Rudiment of gynæceum ellipsoid apiculate, lanate at base. Female calyx ventricose-tubular;

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[1] A genus especially distinguished from preceding genus by its early deciduous stigma.

[2] Spec. 2. HOOK. & ARN., *Voy. Beech., Bot.* 96 (*Bœhmeria*).—MEYEN, *Reis.*, ii. 124.—GAUDICH., *Voy. Bon., Bot.*, t. 133.

[3] *Voy. Bon., Bot.*, t. 91, 92.—WEDD., *Monogr.*, 451, t. 15, C; *Prodr.*, 235[20].—*Oreocnide* MIQ., *Pl. Jungh.*, i. 39; *Fl. Ind. Bat.*, i. p. ii. 269.—*Morocarpus* SIEB. & ZUCC., in *Münch. Abh. d. Math.-Phys. Kl. Akad. Wiss.*, iv. 3 (part.).

[4] Spec. 6–8. BL., *Bijdr.*, 506 (*Urtica*); *Mus. Lugd.-Bat.*, ii. 166.—BENTH., *Fl. Hongkong.*, 332.—WEDD., in *Ann. Sc. Nat.*, ser. 4, i. 195.—HASSK., *Hort. Bog.*, 79 (*Bœhmeria*).

[5] *Voy. Bon., Bot.*, t. 90.—WEDD., *Monogr.*, 459, t. 14, 15, A; *Prodr.*, 235[23].—SIEB. & ZUCC., in *Münch. Abh. d. Math.-Phys. Kl. Akad. Wiss.*, iv. 3 (part.).

mouth contracted, 4-dentate. Germen obovate-oblong, subadnate to calyx; ovule suberect; funicle short; stigma sessile penicillate-capitate. Achene nucamentaceous, fleshy outside and clothed in accrete baccate adnate obovate calyx. Seed erect; albumen fleshy; cotyledons of fleshy embryo small subrotundate, nearly as long as conoid radicle.—Shrubs; leaves alternate serrate, often wrinkled, ashy or white-tomentose beneath; stipules axillary, 2-fid; flowers at apices of twigs of forked or 2-chotomous peduncle; males glomerulate; females capitellate; glomeruli and capitula solitary or paired; receptacle hardly fleshy; peduncles paired in each axil, sparsely bracteolate (*Abyssinia, India, Malaysia*[1]).

28. **Pipturus** WEDD.[2]—Flowers diœcious. Male calyx 4, 5-lobed; lobes ovate-acute. Stamens 4, 5. Rudiment of gynæceum clavate lanate. Female calyx ovoid-ventricose, gradually tapering above; mouth contracted very small, 4–5-denticulate. Germen of same shape as and adnate to calyx; ovule erect; funicle short; stigma elongate-filiform, articulated at base, very caducous, hence glabrous. Achene nucamentaceous, closely enveloped in accrete baccate ventricose adnate calyx (?). Seed erect; albumen scanty; cotyledons of rather fleshy embryo ovate or elliptical a little longer than radicle.—Small trees or shrubs, sometimes climbing, rather glabrous or more often downy or tomentose; leaves alternate petiolate equilateral, entire or dentate, 3-ribbed; often greyish, 3-ribbed beneath; cystoliths punctiform; stipules 2, axillary connate to one deeply 2-fid; flowers closely glomerulate or capitate; inflorescences axillary or interruptedly spicate; spikes sometimes 2-stichously branching; female receptacle finally fleshy moriform; bracts ∞, small hirsute (*Oceania, Malaysia, Mascarene Islands*[3]).

29. **Maoutia** WEDD.[4]—Flowers monœcious or diœcious. Male

[1] Spec. 5. BL., *Mus. Lugd.-Bat.*, ii. 155 (*Morocarpus*).—MIQ., *Fl. Ind. Bat.*, i. p. ii. 272 (*Morocarpus*); *Pl. Jungh.*, i. 36 (*Leucocnide*).—WEDD., in *Ann. Sc. Nat.*, ser. 4, i. 195 (*Missiessya*).—WIGHT., *Icon.*, vi. 7. t. 1959 (*Conocephalus*)—HOCHST., in *A. Rich. Fl. Abyss. Tent.*, ii. 264 (*Procris*).—WALL., *Cat.*, n. 4067 (*Urtica*).

[2] In *Ann. Sc. Nat.*, ser. 4, i. 196; *Monogr.*, 444, t. 15, D; *Prodr.*, 235 [16].—*Nothocnide* BL., *Mus. Lugd.-Bat.*, ii. f. 14.—*Prætoria* H. BN., *Et. Gén. Euphorbiac.*, 469.

[3] Spec. 8. POIR., *Dict.*, iv. 644, n. 38 (*Urtica*).—HOOK. & ARN., *Voy. Beech.*, *Bot.*, 96 (*Bœhmeria*).—BL., *Bijdr.*, 497, 501 (*Urtica*); Herb. (*Croton*).—LABILL., *Sert. Austro-Caled.*, 79, t. 80 (*Urtica*).—DCNE., *Herb. Timor.*, 163 (*Bœhmeria*).—MIQ., *Fl. Ind. Bat.*, i. p. ii. 267.—SEEM., *Fl. Vit.*, 243.

[4] In *Ann. Sc. Nat.*, ser. 4, i. 193; *Monogr.*

calyx 5-partite; segments ovate, usually shortly acuminate, rather hispid outside, valvate. Stamens 5. Rudiment of gynæceum obovoid, nestling in dense wool. Male calyx 0, or very rarely short.[1] Germen ovoid straight, bristly or subappressed-hispid; ovule suberect; stigma (borne on short style) sublateral, lanceolate or subcapitate, shortly or long-papillose, persistent. Achene ovate rather compressed or obtusely 3-gonous, hispid or bristly; pericarp fleshy outside, inside nucamentaceous or bony, sometimes thickly marginate. Seed elliptical compressed; albumen scanty; cotyledons elliptical or oblong, a little longer than slender radicle.—Shrubs; leaves alternate, serrate or crenulate, 3-ribbed, grey beneath; cystoliths punctiform; stipules axillary, generally 2-fid; flowers in capitula or glomeruli loosely and irregularly cymose, bracteate at base; inflorescences axillary, usually paired (*East India, Malaysia, Oceania*[2]).

30. **Myriocarpa** Benth.[3]—Flowers diœcious or more rarely monœcious. Male calyx 4- or more rarely 3, 5-partite; segments ovate-obtuse ciliolate. Stamens 4, or more rarely 3, 5. Rudiment of gynæceum small conical glabrous. Female calyx 0. Germen elliptical-compressed, tapering at base, tapering at apex into a rather long style stylose-ciliate-like germen; stigma lateral semilunar villous-papillose, persistent; ovule erect; funicle slender. Achene tapering at base. Seed erect; cotyledons of fleshy embryo rotundate, half as long again as conical radicle.—Small trees or shrubs, more or less downy; leaves alternate petiolate dentate, 3-ribbed; cystoliths linear radiating from base of hairs of superior surface; stipules axillary entire; male flowers glomerulate; female supported on 2–4-phyllous calycle, in spikes or sub-1-lateral very slender pendulous racemes (*North and South Tropical West America*[4]).

476, t. 16, B; *Prodr.*, 235 [30].—*Lecanocnide* Bl., *Mus. Lugd.-Bat.*, ii. f. 12.

[1] In 1 spec., *M. ambigua* (Wedd., *Monogr.*, 483; *Prodr.*, n. 8), approaching the genus *Missiessya.*

[2] Spec. 8. Miq., in *Zoll. et Mor. Verz.*, 100; *P* p.*Jungh.*, i. 34 (*Bœhmeria*); *Fl. Ind. Bat.*, i. *l.* ii. 272.—Wall., *Cat.*, n. 4605 (*Urtica*).—Bl., *Bijdr.*, 498 (*Urtica*).—Seem., *Fl. Vit.*, 244.

[3] *Voy. Sulph.*, *Bot.*, 168.—Wedd., *Monogr.*, 484, t. 16, D; *Prodr.*, 235 [33].

[4] Spec. 6. Miq., in *Mart. Fl. Bras.*, *Urtic.*, 197.—Liebm., in *Kœn. Dansk. Vid. Selsk. Skr.*, 5 *Rækk.*, *Nat. og Math. Afd.*, ii. 306.—Wedd., in *Ann. Sc. Nat.*, ser. 3, xviii. 231.

31. **Phenax** WEDD.[1]—Flowers monœcious or diœcious. Male calyx 3–5-lobed; lobes ovate, usually rather long mucronate below apex, more rarely transversely folded. Stamens 3–5; filaments thick, sometimes adnate at base to rudiment of gynæceum. Rudiment of gynæceum narrowly conical or linear, lanate. Female calyx 0.[2] Germen ovoid glabrous or hairy at margin at apex; ovule almost erect; stigma elongated filiform, one side glabrous or hairy; the other subvillous. Achene ovoid minute ventricose, usually punctulate-verruculose, crowned with stigma and for a long time obvallate-concealed by scarious floral bract; pericarp thin crustaceous. Seed erect; cotyledons of albuminous embryo subrotundate, a little longer than terete radicle.—Shrubs or undershrubs, diffusely branching, glabrous or variously downy; leaves alternate petiolate equilateral, entire or more often dentate, 3–5-ribbed; cystoliths very small punctiform; stipules free rusty-scarious; flowers axillary densely conglomerate; both sexes intermingled; male pedicels articulate; female 0, or nearly absent; bracts rusty, sometimes rather large, usually ciliate (*Tropical America, Mauritius*[3]).

32 ? **Leucosyke** ZOLL. & MOR.[4]—Flowers monœcious or very often diœcious. Male calyx 4, 5-partite; segments ovate acute, valvate. Stamens 4, 5. Rudiment of gynæceum conical, glabrous or lanate. Female calyx short or very short, cupuliform, shortly and usually obtusely 4, 5-dentate. Germen oblique elliptical-ovoid subcompressed, glabrous or strigillose at margins above; ovule erect; funicle short; exostome usually dilated fimbriate, adherent to top of cell; stigma subpeltate or penicillate-capitate long-papillose. Achene sometimes rather fleshy subdrupaceous outside; endocarp chartaceous. Seeds erect; albumen scanty, cotyledons elliptical, hardly longer than terete radicle.—Small trees or shrubs; leaves 2-stichously alternate subequilateral, more or less serrate, 3-ribbed, grey-tomentose beneath; stipules 2, connate to 1 axillary, 2-fid; male flowers glomerulate, bracteate;

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[1] In *Ann. Sc. Nat.*, ser. 4, i. 191; *Monogr.*, 490, t. 16, A; *Prodr.*, 235 [36].

[2] According to BL., equal to germen, and closely adnate as far as apex.

[3] Spec. 10. SPRENG., *Syst.*, iii. 847 (*Procris*). —JACQ., *Eclog.*, t. 135 (*Bœhmeria*).—POIR., *Dict.*, v. 15, n. 4 (*Parietaria*); 628, n. 2 (*Procris*).—H. B. K., *Nov. Gen. et Spec.*, ii. 34 (*Bœhmeria*).—SW., *Fl. Ind. Occ.*, i. 285 (*Procris*).—GRISEB., *Cat. Pl. Cub.*, 60 (*Procris*).—MIQ., in *Mart. Fl. Bras.*, *Urtic.*, 194 (*Gesnouinia*).

[4] *Verzn.*, 76.—MIQ., in *Zoll. et Mor. Verzn.*, 100. — WEDD., *Prodr.*, 235 [26]. — *Missiessya* GAUDICH., *Voy. Coq.*, *Bot.*, t. 93.

female densely aggregate, globular, finally fleshy; receptacle sessile or shortly pedicellate; pedicels terete, or thickened above, bracteolate; capitula axillary, geminate or more rarely corymbose, sometimes irregularly cymose (*Malay, Oceania*[1]).

IV. PARIETARIEÆ.

33. **Parietaria** T.—Flowers monœcious or polygamous. Calyx 4-merous; sepals in hermaphrodite or male flowers ovate or shortly acuminate (2 anterior), valvate, finally patent, in females more or less highly connate to tubular or ventricose calyx, glabrous or lanate within. Stamens 4, oppositisepalous hypogynous; filaments incurved in bud, finally elastically recurved or straight; anthers introrse, or in female flower rudimentary or 0. Germen (rudimentary in male flower) straight, ovoid or oblong; ovule ascending or suberect; style elongated filiform, erect or short; apex long laterally papillose, linear (*Gesnouinia*) or aspergilliform. Fruit dry straight ovoid-subcompressed shining included in marcescent (often elongated) cylindrical perianth; cotyledons of albuminous embryo ovate-oblong nearly as long as radicle.—Shrubs undershrubs or herbs, usually covered with hamate hairs; leaves alternate entire, 3-ribbed or 3-plicostate; cystoliths punctiform; stipules small or 0; flowers densely or rather laxly cymose; cymes axillary, paired, sometimes 1-flowered (*Helxina*); inflorescence androgynous, 3-flowered (*Gesnouinia*), or more often polygamous, 3–∞-flowered; herbaceous bracts 1-3, involucrant (*Temperate and subtropical regions of both hemispheres*). See p. 504.

34. **Hemistylis** Benth.[2]—Flowers monœcious. Male calyx 4-partite; segments acute, valvate. Stamens 4. Rudiment of gynæceum obovate, lanate at base. Female calyx ventricose-tubular; mouth contracted, 4-dentate. Germen ovoid-lanceolate free; ovule erect; style filiform, straight or incurved, sometimes stigmatose from base to apex, articulate at base, soon deciduous. Achene compressed, for

[1] Spec. 9. Wedd., in *Ann. Sc. Nat.*, ser. 4, i. 195; *Monogr.*, 465, t. 15, fig. 18 (*Missiessya*).—Bl., *Bijdr.*, 498 (*Urtica*); *Mus. Lugd.-Bat.*, ii. t. 24 (*Touchardia*).—Roxb., *Fl. Ind.*, iii. 589 (*Urtica*).—Miq., *Fl. Ind. Bat.*, i. p. ii. 264.—Seem., *Fl. Vit.*, 244 (*Missiessya*).

[2] *Plant. Hartweg.*, 123.—Wedd., *Monogr.*, 524, t. 18, C; *Prodr.*, 235[51].

a long time clothed in calycle and much compressed persistent calyx membranous-marginate, by one face adherent to tube of involucre by other connate to calyx of adjacent flower.[1] Seed erect; albumen scanty; cotyledons quadrate-orbicular, emarginate at both ends longer than ovoid radicle.—Small trees or shrubs; leaves alternate full, more often entire, 3-costate or 3-plicostate; cystoliths punctiform stipules axillary free, caducous; male flowers in spiked glomeruli females in 2-flowered small cymes; male glomeruli (sometimes with few flowers) in axils of small subscarious bracts; female cymules involucrate at base of male spike, or sessile in axils of higher leaves of branch, more rarely constituting distinct inflorescence; bracts of involucre 2, broadly ovate with linear lobule on both sides at bottom of narrowed base, connate into a short tube; receptacle of involucre sometimes more or less produced between fruits (*Columbia*[2]).

35? **Rousselia** GAUDICH.[3]—Flowers monœcious. Male flowers nearly of *Hemistylis*; rudiment of gynæceum narrow conical or rather terete. Female calyx ventricose-tubular; mouth contracted, 2–4 dentate. Germen ovoid free; ovule erect; style filiform incurved articulate at base, 1-laterally[4] papillose-plumose. Achene compressed for a long time clothed in developed involucre, and narrowly membranous marginate by compressed accrete calyx, which is sometimes coherent with upper excavated surface of involucre. Seed erect; embryo scantily albuminous (of *Hemistylis*).—A perennial herb, sometimes suffruticose at base; stem slender creeping; leaves alternate entire, 3-ribbed; stipules free petiolar, persistent; flowers cymulose in its higher leaves; small cymes rather laxly few-flowered, exinvolucrate; females 2-flowered involucrate; bracts of involucre 2, sessile, broadly ovate entire; female receptacle compressed disciform, bearing horizontally patent or diverging flowers on both faces[5] (*Antilles*[6]).

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[1] Very often afterwards splitting from base to apex on either edge.

[2] Spec. 4. WEDD., in *Ann. Sc. Nat.*, ser. 4, i. 208.—MIQ., in *Mart. Fl. Bras.*, *Urtic.*, 193.

[3] *Voy. Uran.*, *Bot.*, 503; *Voy. Bon.*, *Bot.*, t. 98.—WEDD., *Monogr.*, 527, t. 18, D; *Prodr.*, 235 [53].

[4] "Behind." (WEDD.)

[5] Allied to preceding by character of calyx differing in inflorescence and involucre.

[6] Spec. 1. *R. lappulacea* GAUDICH., *loc. cit.*—GRISEB., *Fl. Brit. W.-Ind.*, 159; *Cat. Pl. Cub.* 60.—*Urtica lappulacea* Sw., *Fl. Ind. Occ.*, 37.—*U. humilis* Sw., *loc. cit.*

V. FORSKOHLEÆ.

36. **Forskohlea** L.—Flowers monœcious. Male calyx 1-phyllous, narrowly tubular at base, obtusely 3-dentate at dilate apex, longitudinally open behind, hence bracteiform. Stamen 1, anterior; filament incurved; anther introrse 2-celled, 2-rimose. Female calyx, like male, anterior bracteiform. Germen free; style filiform, villous-hispidate at stigmatose apex; ovule 1, ascending, orthotropous. Fruit dry straight compressed punctulate, covered with cottony wool; seed suberect; cotyledons of albuminous embryo subrotundate, emarginate at base, longer than radicle.—Undershrubs or herbs, tough, sometimes (*Euforskohlea*) covered with hamate hairs; leaves alternate or more rarely opposite, crenate or dentate; cystoliths punctiform; stipules lateral free; flowers in campanulate or turbinate involucres; males more numerous peripheral, or more rarely 0; females few (1–6) central; bracts of involucre 2–6, nearly free or more rarely (*Droguetia*) more or less highly connate (*South Europe, warm Africa, South-west Asia*). See p. 506.

37. **Distemon** WEDD.[1]—Flowers monœcious. Male calyx sub-infundibuliform, bipartite; segments equal entire shortly acuminate. Stamens 2. Rudiment of gynæceum linear lanate. Female calyx tubular-ventricose, adnate to germen; limb very small denticulate. Germen straight oblong-lanceolate; ovule suberect; funicle very short; style linear, articulate at base, soon deciduous, sometimes stigmatose-papillose from base to apex. Fruit simple or double,[2] nucamentaceous, clothed in persistent finally rather fleshy ovate calyx, adnate outside.[3] Seed erect; cotyledons of albuminous embryo quadrate-rotundate, longer than conical radicle.—A perennial herb; stem erect; leaves alternate largely serrate, 3-ribbed; stipules lateral free; flowers in small-flowered, often 3-flowered, exinvolucrate laxly spicate glomeruli; females often 2-nately concrete (*East India, Java*[4]).

38. **Australina** GAUDICH.[5]—Flowers monœcious. Male calyx

[1] *Monogr.*, 550, t. 20, A; *Prodr.*, 234 [62].
[2] That is formed from 2 concrete flowers.
[3] Whence spuriously drupaceous.
[4] Spec. 1. *D. grossum* WEDD., *Prodr.*, *loc. cit.*—*D. indicum* WEDD., *Monogr.*, 551.—MIQ., *Fl. Ind. Bat.*, i. p. ii. 275.—*Urtica grossa* WALL., *Cat.*, n. 4615.
[5] *Voy. Uran.*, *Bot.*, 505.—WEDD., *Monogr.*, 543, t. 20, C; *Prodr.*, 235 [59].

gamophyllous, infundibuliform or subcampanulate, unequal-2-lipped; exterior lip longer inflexed in bud. Stamen 1. Female calyx ventricose-tubular; limb sub-5-dentate. Germen straight; ovule erect; funicle short or 0; style linear, sometimes more villous. Achene ovate included in persistent calyx. Seed erect; albumen scanty; cotyledons broadly elliptical, longer than conical radicle.—Perennial herbs; stem creeping; leaves alternate or more rarely opposite, petiolate, serrate or crenate, 3-ribbed; stipules lateral petiolar, connate interpetiolar leaf-opposed in some plants; flowers in cymes or few-flowered, sometimes 1-flowered, exinvolucrate glomeruli; small female cymes sessile, sometimes 1-flowered; males pedunculate, 2-flowered (*Australia, Tasmania, New-Zealand, Abyssinia*[1]).

39. **Didymodoxa** E. MEY.[2]—Flowers monœcious. Male calyx subbracteiform, shortly tubular at base, cucullate acuminate at apex; edges ciliate closely connivent in lanceolate bud. Stamen 1. Female calyx 0. Germen straight; ovule erect; stigma subcapitate or shortly filiform, sometimes incurved, rather villous. Achene ovate suboblique compressed, hence rather thick-keeled. Seed erect; albumen scanty; cotyledons rotundate subequal to terete radicle.—Annual diffuse branching herbs; leaves alternate, entire or crenate, 3-ribbed; stipules petiolar scarious ciliate; flowers in axillary exinvolucrate androgynous glomeruli; females sometimes 2-nately concrete[3] (*Cape of Good Hope*[4]).

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[1] Spec. 3. POIR., *Dict.*, Suppl., iv. 224, n. 76 (*Urtica*).—A. RICH., *Fl. Abyss. Tent.*, ii. 259 (*Pouzolzia*).—WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 212.—F. MUELL., *Syst. Ind. Pl. Vict.*, 18.—HOOK. F., *Fl. Nov.-Zel.*, 225; *Fl. Tasman.*, i. 345.

[2] In *Exs. Drège* (ex WEDD., *Monogr.*, 547, t. 20, B; *Prodr.*, 235 [61]).

[3] A genus very near *Australina*, differing in androgynous inflorescence and female calyx 0.

[4] Spec. 3. THUNB., *Prodr.*, 31 (*Parietaria*)?—WEDD., in *Ann. Sc. Nat.*, sér. 4, i. 212 (*Australina*).

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